P.O.L.

CLASS A NETWORK DATARING GAUGES
1987 DATA PROCESSING AND ANALYSIS

BY
S.M. SHAW

REPORT NO. 5
1988

NATURAL ENVIRONMENT RESEARCH COUNCIL
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PROUDMAN OCEANOGRAPHIC LABORATORY

REPORT No.5

Class A Network Dataring gauges
1987 data processing and analysis

S.M. Shaw

1988

DOCUMENT DATA SHEET

AUTHOR
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PUBLICATION DATE 1988

TITLE
Class A Network Dataring gauges - 1987 data processing and analysis

REFERENCE
Proudman Oceanographic Laboratory Report, No.5, 97pp

ABSTRACT

This report summarises and presents sea level data for 1987 from 13 Dataring sites on the UK coast.

Details of processing, reference levels and data statistics and analyses are included.

This work is funded by MAFF.

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KEYWORDS
SEA LEVEL MEASUREMENT
SHORE BASED TIDE GAUGES
TIDAL RECORDS
SEA LEVEL MEASUREMENTS
DATA PROCESSING
NORTHWEST EUROPEAN WATERS
BRITISH WATERS

CONTRACT

PROJECT MLS-61-1

PRICE £26

CONTENTS

1. INTRODUCTION

There are now 17 sites on the class A network of tide gauges which are contacted through the Data Acquisition for Tidal Applications for the Remote Interrogation of Network Gauges (DATARING) system. Thirteen of these have been operational in excess of one year (Figure 1) and the results from these are presented here.

Each site has two recording systems, based on either a digiquartz pressure system and/or potentiometer configuration inside a stilling well.

Rapid sampling by each sensor produces average values over a 15-minute period which are then converted to elevations referenced to Chart Datum.

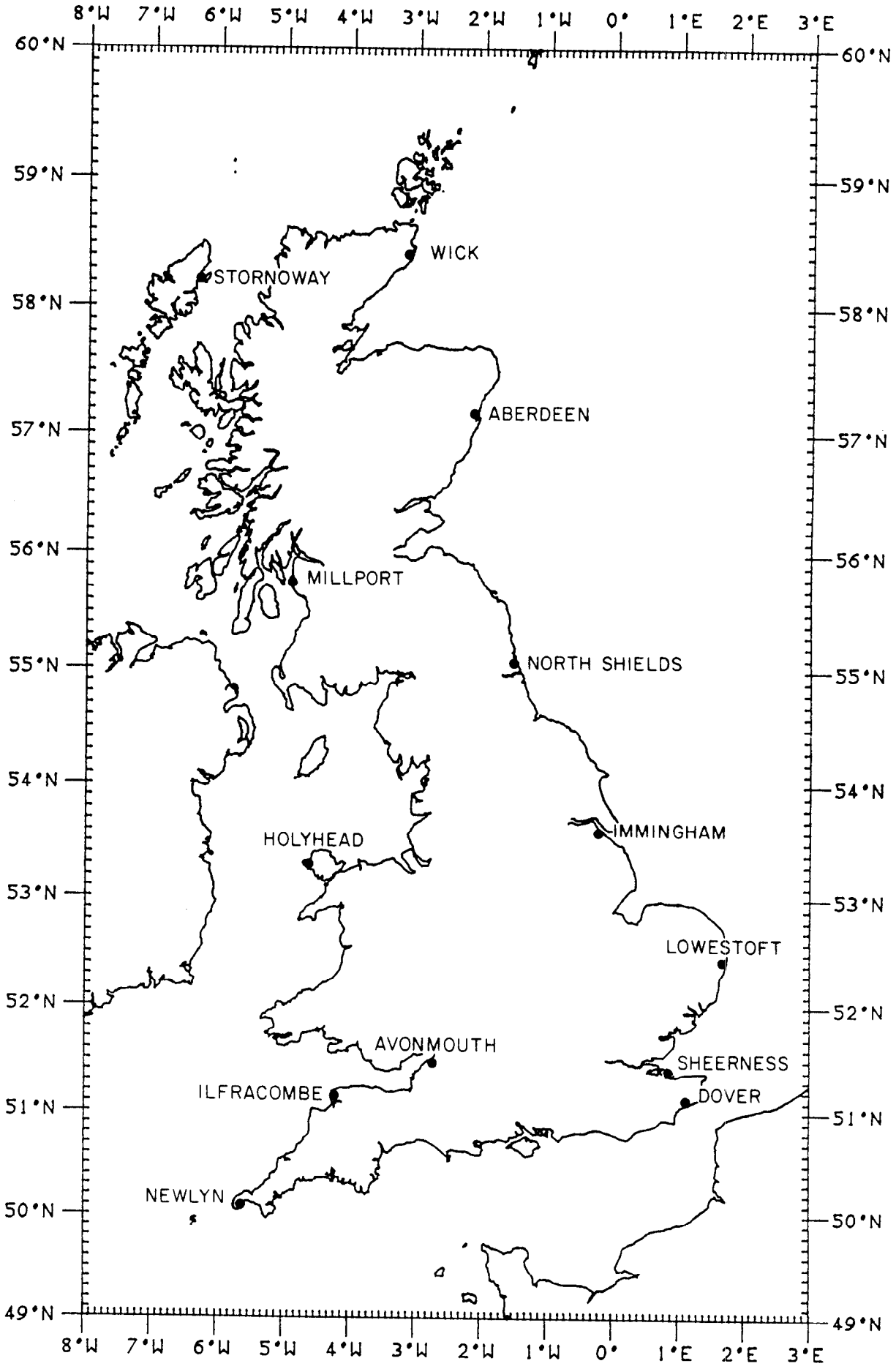
Values are stored on a microprocessor until interrogated from the central site, usually on a weekly basis.

Where both a digiquartz and potentiometer exist, the digiquartz is treated as the primary (class A) sensor.

Values are filtered to hourly heights and compared with predicted levels from the most accurate tidal analysis available.

Section 2 contains a general description of each site and processing, including harmonic constants from an independent analysis of the 1987 data, and presentation of the hourly observations in the form of frequency distribution and cumulative frequency curves.

Section 3 contains the statistics of extreme and mean sea level and tide and surge residuals.


8°W 7°W 6°W 5°W 4°W 3°W 2°W 1°W 0° 1°E 2°E 3°E
60°N
59°N
58°N
57°N
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55°N
54°N
53°N
52°N
51°N
50°N
49°N
WICK
STORNOWAY
ABERDEEN
MILLPORT
NORTH SHIELDS
HOLYHEAD
IMMINGHAM
LOWESTOFT
AVONMOUTH
SHEERNESS
ILFRACOMBE
DOVER
NEWLYN

Figure 1.

2. GENERAL DESCRIPTION OF SITES AND PROCESSING

2.1 NEWLYN Primary DQ Channel 2
Secondary Pot. Channel 1 (Munro gauge well)
Sea temperature values also recorded at 15-min. intervals

TGZ = ACD = 3.05m below ODN
TGZ = 7.8m below TGBM

Details of Tide Gauge Bench Mark
.....

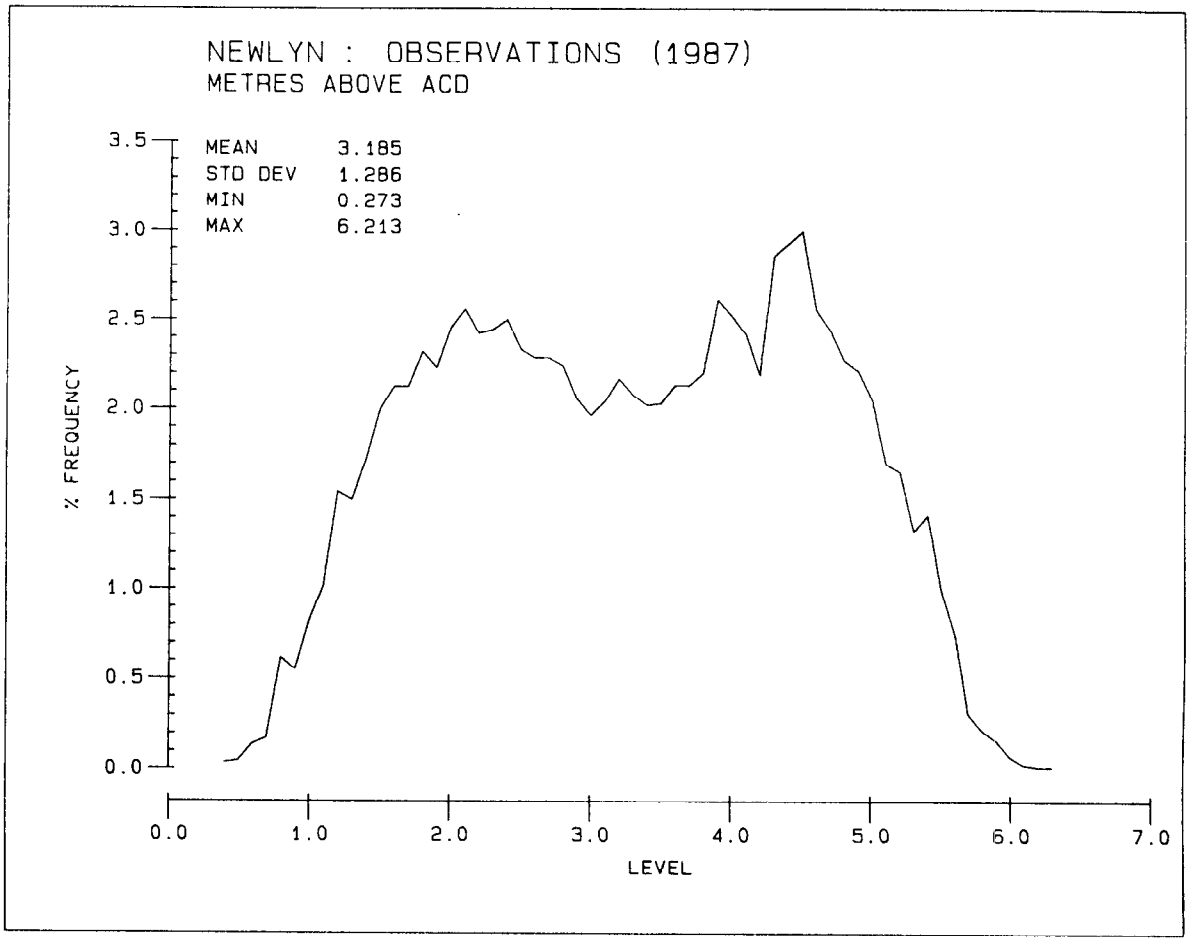
OSBM Bolt inside hut adjacent to well
National Grid reference SW 4676 2855

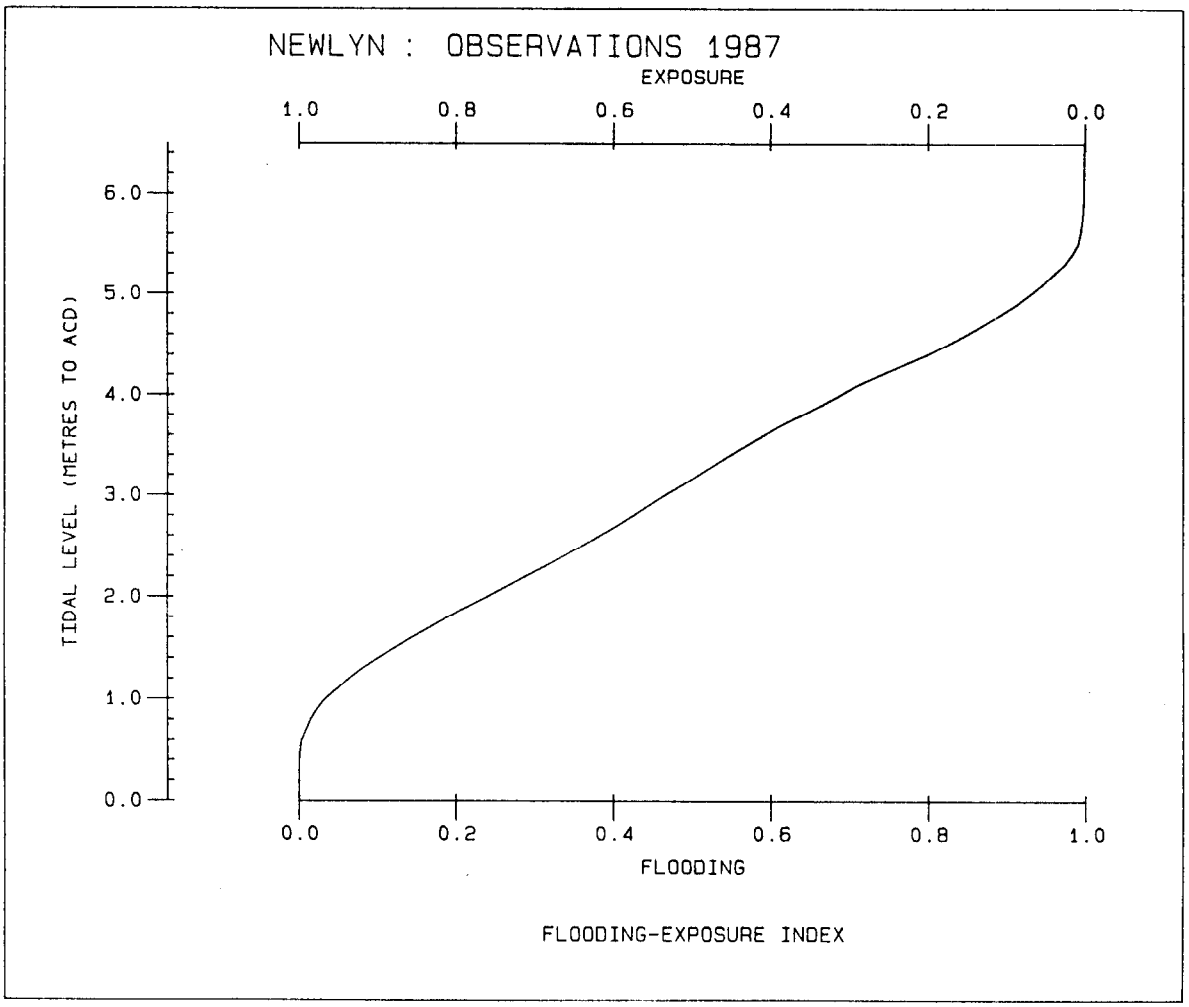
Filtered hourly heights
.....

Nil gaps

Site Diary
.....

4-6 March TGI visit.	Dataring sensors calibrated, and faulty clock driver on Munro gauge replaced.
14 May	Site visited by P.O.L. divers
02 August	" " " " "
15 September	Site visited by divers; orifice to stilling well enlarged to improve response time.
30 September	TGI visit. Munro Dataring sensor (Channel 1) recalibrated.
	Extra scans removed in data-reduction


NEWLYN : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 3.185
STD DEV 1.286
MIN 0.273
MAX 6.213
% FREQUENCY
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0
LEVEL


NEWLYN : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, SOUTH COAST - NEWLYN

LATITUDE: 50 06' 08.7" N

LONGITUDE: 5 32' 30.0" W

TIME ZONE: GMT

LENGTH: 365 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 3.187

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 3.05 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.3187D+01 RESIDUAL MEAN = 0.2086D-06
STD = 0.1287D+01 STD = 0.1069D+00

	H	G		H	G		H	G		H	G
SA	0.086	216.57	2Q1	0.005	238.30	OQ2	0.009	21.77	MO3	0.004	152.79
SSA	0.035	62.62	SIGMA1	0.003	337.29	MNS2	0.015	145.68	M3	0.011	33.99
MM	0.038	136.66	Q1	0.019	289.83	2N2	0.064	95.85	SO3	0.001	239.10
MSF	0.022	260.43	RHO1	0.005	281.03	MU2	0.053	167.70	MK3	0.005	285.35
MF	0.019	210.01	O1	0.054	340.20	N2	0.330	113.55	SK3	0.002	71.44
			MP1	0.001	212.45	NU2	0.073	105.75			
			M1	0.002	130.46	OP2	0.004	55.94	MN4	0.043	138.45
			CHI1	0.001	114.17	M2	1.717	133.13	M4	0.115	165.76
			PI1	0.001	67.61	MKS2	0.008	247.82	SN4	0.007	207.58
			P1	0.021	101.34	LAMDA2	0.035	129.46	MS4	0.076	217.20
			S1	0.002	37.50	*L2	0.078	138.28	MK4	0.022	216.90
			K1	0.064	109.50	T2	0.034	171.14	S4	0.009	278.19
			PSI1	0.001	76.30	S2	0.581	177.23	SK4	0.005	279.94
			PHI1	0.002	154.00	R2	0.003	166.88			
			THETA1	0.002	105.05	K2	0.167	174.65	2MN6	0.005	298.22
			J1	0.002	233.89	MSN2	0.023	347.72	M6	0.009	326.55
			SO1	0.002	342.67	KJ2	0.008	51.49	MSN6	0.002	32.64
			OO1	0.001	283.41	2SM2	0.023	27.06	2MS6	0.009	23.99
									2MK6	0.003	24.80
									2SM6	0.003	112.85
									MSK6	0.002	110.99

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, SOUTH COAST - NEWLYN
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.003	294.30
3M(SK)2	26.87018	0.007	341.76
3M2S2	26.95231	0.012	355.30
SNK2	28.35759	0.002	55.16
2SK2	29.91786	0.002	128.65
MQ3	42.38277	0.001	132.75
2MP3	43.00928	0.002	78.50
2MQ3	44.56955	0.003	33.98
3MK4	56.87018	0.009	258.39
3MS4	56.95231	0.005	228.68
2MSK4	57.88607	0.003	328.16
3MK5	71.91124	0.001	269.39
M5	72.46026	0.001	123.60
3MO5	73.00928	0.002	346.42
2(MN)S6	84.84767	0.001	21.07
3MNS6	85.39204	0.002	20.77
4MK6	85.85428	0.002	60.31
4MS6	85.93642	0.002	49.79
2MSNK6	86.32580	0.001	102.12
2MV6	86.48079	0.002	265.60
3MSK6	86.87018	0.001	133.06
4MN6	87.49669	0.003	146.43
3MSN6	88.51258	0.003	210.22
2(MN)8	114.84767	0.001	225.47
3MN8	115.39204	0.002	247.49
M8	115.93642	0.003	271.04
2MSN8	116.40794	0.002	297.44
3MS8	116.95231	0.004	320.87
3MK8	117.03445	0.001	322.78
MSNK8	117.50597	0.001	8.59
2(MS)8	117.96821	0.002	10.85
2MSK8	118.05035	0.001	14.10
4MS10	145.93642	0.001	107.80
3M2S10	146.95231	0.001	153.28
MVS2	27.49669	0.007	170.94
MA2	28.94304	0.005	79.88
MB2	29.02517	0.008	135.30
MSV2	30.47152	0.003	172.43
SKM2	31.09803	0.011	18.34
2MNS4	56.40794	0.004	227.53
MV4	57.49669	0.009	129.28
3MN4	58.51258	0.012	351.65
2MSN4	59.52848	0.007	237.97
NA2	28.39866	0.001	322.87
NB2	28.48080	0.002	96.69
MSO5	72.92714	0.001	59.77
MSK5	74.02517	0.001	326.78

2.2 ILFRACOMBE Primary DQ Channel 2
Secondary Pot. Channel 1 (Ott gauge well)

TGZ = ACD = 4.8m below ODN
TGZ = 12.379m below TGBM

Details of Tide Gauge Bench Mark
.....

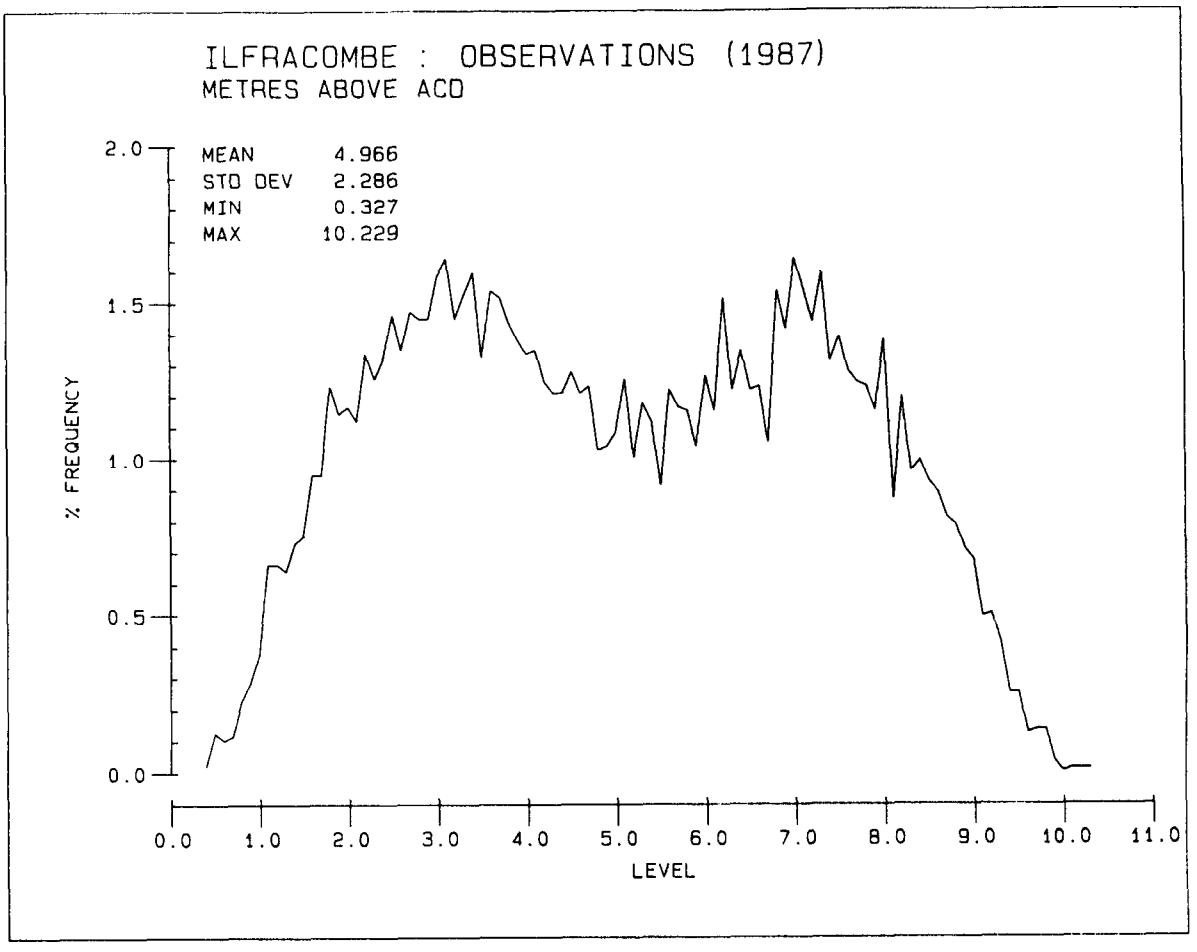
OSBM Bolt on pier, 0.7m from tide gauge hut.
National Grid reference SS 5263 4791

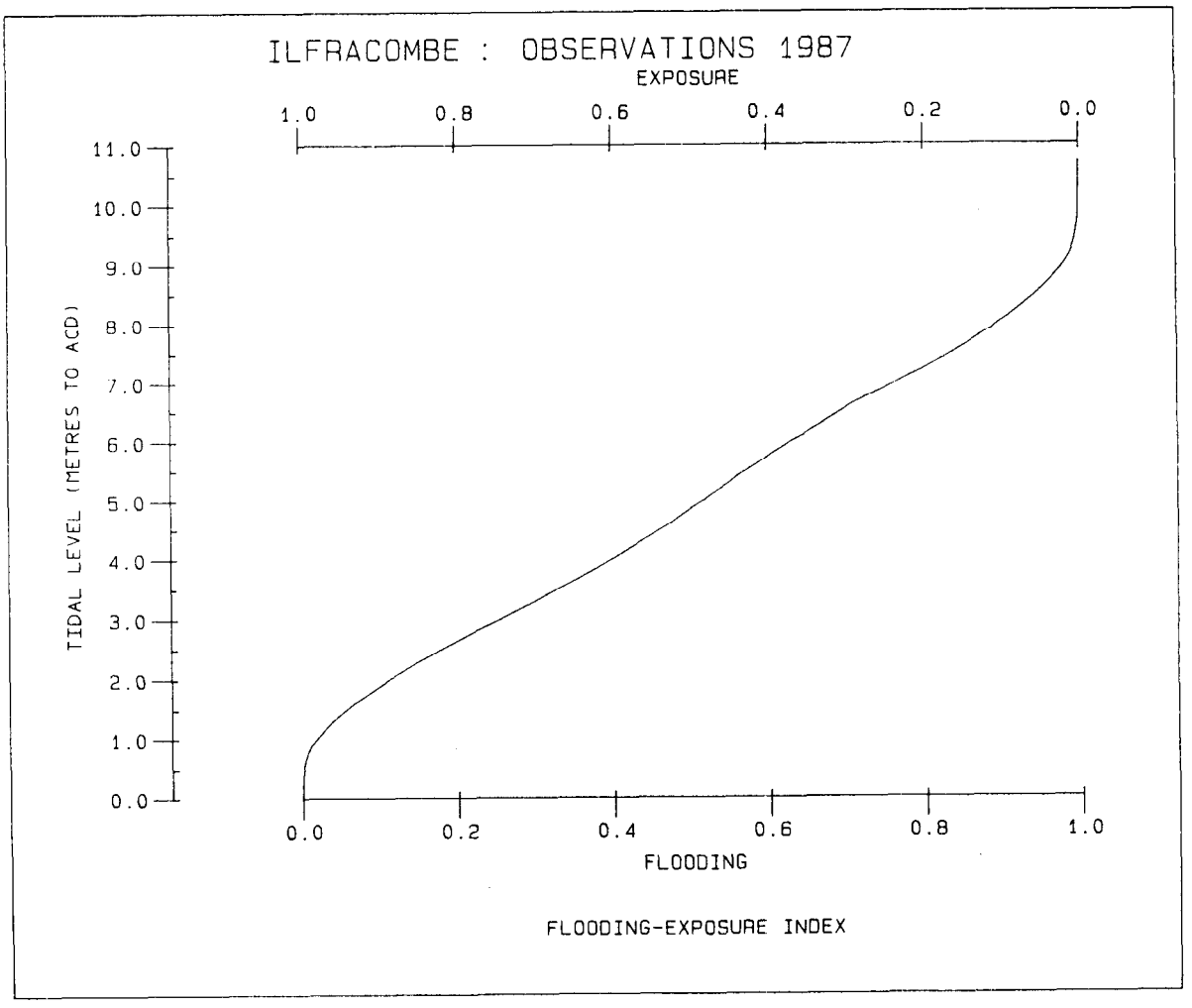
Filtered hourly levels
.....

Nil gaps

Site diary
.....

2-4 March TGI visit. Well head unit repaired (Channel 1) after float wire broke through corrosive action.
Dataring sensors recalibrated.


ILFRACOMBE : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 4.966
STD DEV 2.286
MIN 0.327
MAX 10.229
% FREQUENCY
2.0
1.5
1.0
0.5
0.0
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0
LEVEL


ILFRACOMBE : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, WEST COAST - ILFRACOMBE

LATITUDE: 51 13' N

LONGITUDE: 4 07' W

TIME ZONE: GMT

LENGTH: 365 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 4.969

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 4.80 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.4968D+01 RESIDUAL MEAN = 0.1379D-06
STD = 0.2288D+00 STD = 0.1316D+00

	H	G		H	G		H	G		H	G
SA	0.083	216.36	2Q1	0.008	259.91	OQ2	0.017	45.61	MO3	0.003	197.06
SSA	0.034	52.79	SIGMA1	0.002	45.43	MNS2	0.036	176.12	M3	0.028	127.07
MM	0.043	148.93	Q1	0.026	298.69	2N2	0.116	121.10	SO3	0.003	128.62
MSF	0.040	237.27	RHO1	0.008	300.06	MU2	0.139	194.87	MK3	0.007	134.74
MF	0.018	227.77	O1	0.068	348.13	N2	0.573	144.44	SK3	0.012	234.66
			MP1	0.003	214.43	NU2	0.125	130.83			
			M1	0.002	133.35	OP2	0.014	81.93	MN4	0.038	315.13
			CHI1	0.002	61.24	M2	3.038	162.03	M4	0.109	351.31
			PI1	0.001	124.16	MKS2	0.016	286.51	SN4	0.001	235.09
			P1	0.024	121.03	LAMDA2	0.074	144.93	MS4	0.063	53.66
			S1	0.007	67.94	*L2	0.148	159.46	MK4	0.018	53.25
			K1	0.064	126.84	T2	0.064	202.02	S4	0.002	53.65
			PSI1	0.003	115.48	S2	1.113	208.85	SK4	0.001	118.23
			PHI1	0.001	13.24	R2	0.010	177.06			
			THETA1	0.003	132.04	K2	0.321	206.07	2MN6	0.009	314.55
			J1	0.003	225.45	MSN2	0.049	6.45	M6	0.019	343.09
			SO1	0.002	10.52	KJ2	0.019	95.82	MSN6	0.003	59.57
			OO1			2SM2	0.050	42.99	2MS6	0.026	44.99
									2MK6	0.006	33.50
									2SM6	0.005	139.33
									MSK6	0.003	131.26

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, WEST COAST - ILFRACOMBE
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.002	288.77
3M(SK)2	26.87018	0.014	349.61
3M2S2	26.95231	0.023	0.66
SNK2	28.35759	0.002	22.97
2SK2	29.91786	0.004	185.90
MQ3	42.38277	0.003	70.71
2MP3	43.00928	0.002	222.80
2MQ3	44.56955	0.006	156.35
3MK4	56.87018	0.008	92.97
3MS4	56.95231	0.010	108.09
2MSK4	57.88607	0.005	176.81
3MK5	71.91124	0.001	155.48
M5	72.46026	0.002	146.62
3MO5	73.00928	0.002	264.39
2(MN)S6	84.84767	0.002	36.41
3MNS6	85.39204	0.004	35.86
4MK6	85.85428	0.003	86.00
4MS6	85.93642	0.006	64.86
2MSNK6	86.32580	0.001	134.22
2MV6	86.48079	0.005	280.50
3MSK6	86.87018	0.003	146.32
4MN6	87.49669	0.006	165.49
3MSN6	88.51258	0.008	247.57
MKL6	88.59472	0.001	55.28
2MSN8	116.40794	0.001	327.91
3MS8	116.95231	0.002	31.69
2(MS)8	117.96821	0.001	124.00
4MS10	145.93642	0.001	119.29
MVS2	27.49669	0.016	175.38
MA2	28.94304	0.010	70.03
MB2	29.02517	0.028	170.32
MSV2	30.47152	0.008	219.10
SKM2	31.09803	0.025	31.05
2MNS4	56.40794	0.006	84.66
MV4	57.49669	0.010	307.44
3MN4	58.51258	0.014	202.31
2MSN4	59.52848	0.010	98.18
NA2	28.39866	0.001	26.95
NB2	28.48080	0.001	94.64
MSO5	72.92714	0.001	330.69
MSK5	74.02517	0.001	227.32

2.3 AVONMOUTH Primary DQ Channel 1 (Recording above pressure point known as the 'short leg')
Secondary DQ Channel 2 (known as the 'long leg')

TGZ = ACD = 6.5m below ODN
TGZ = 15.711m below TGBM

Details of Tide Gauge Bench Mark
.....

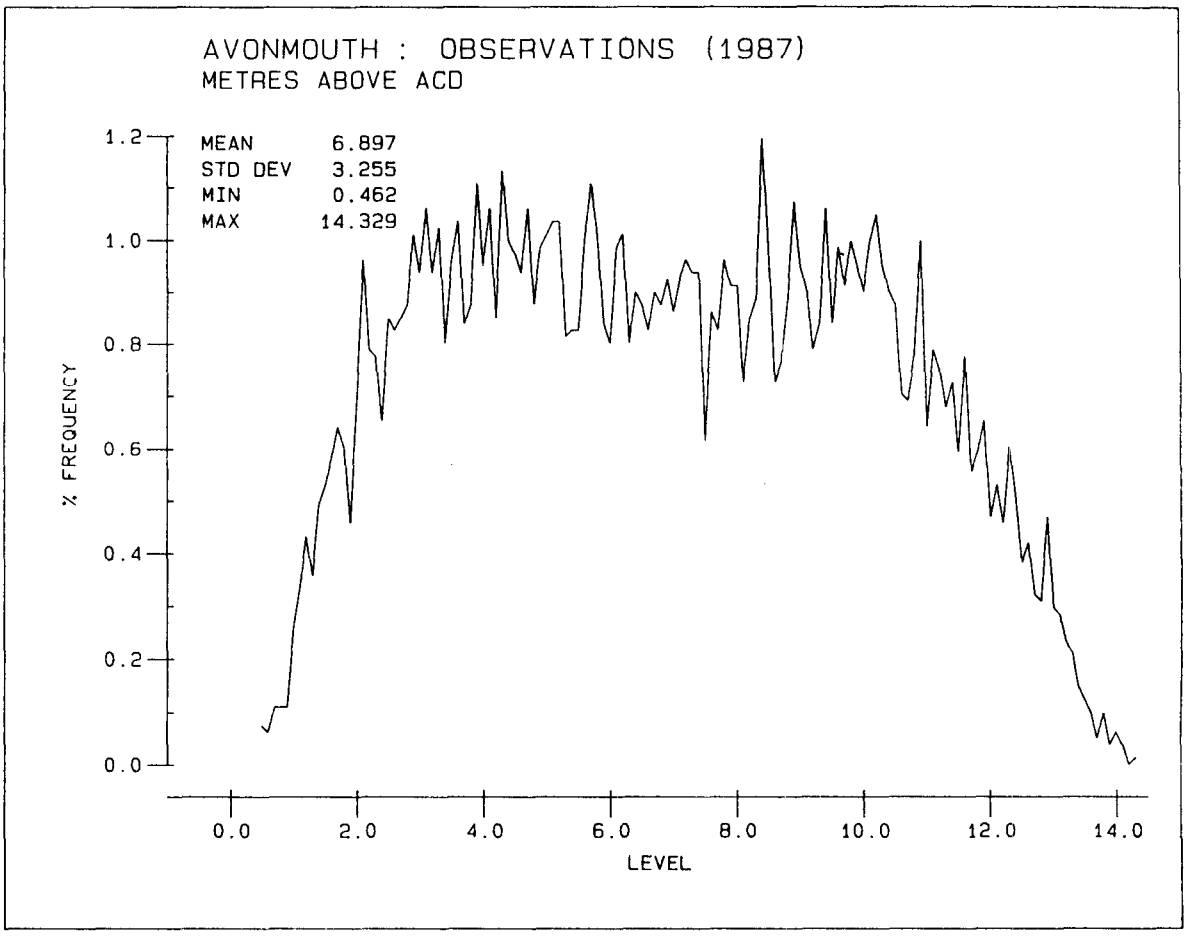
OSBM Bolt, base of bollard 24.97m SE of E angle of building
35.0m W of W angle of building
National Grid reference ST 5057 7881

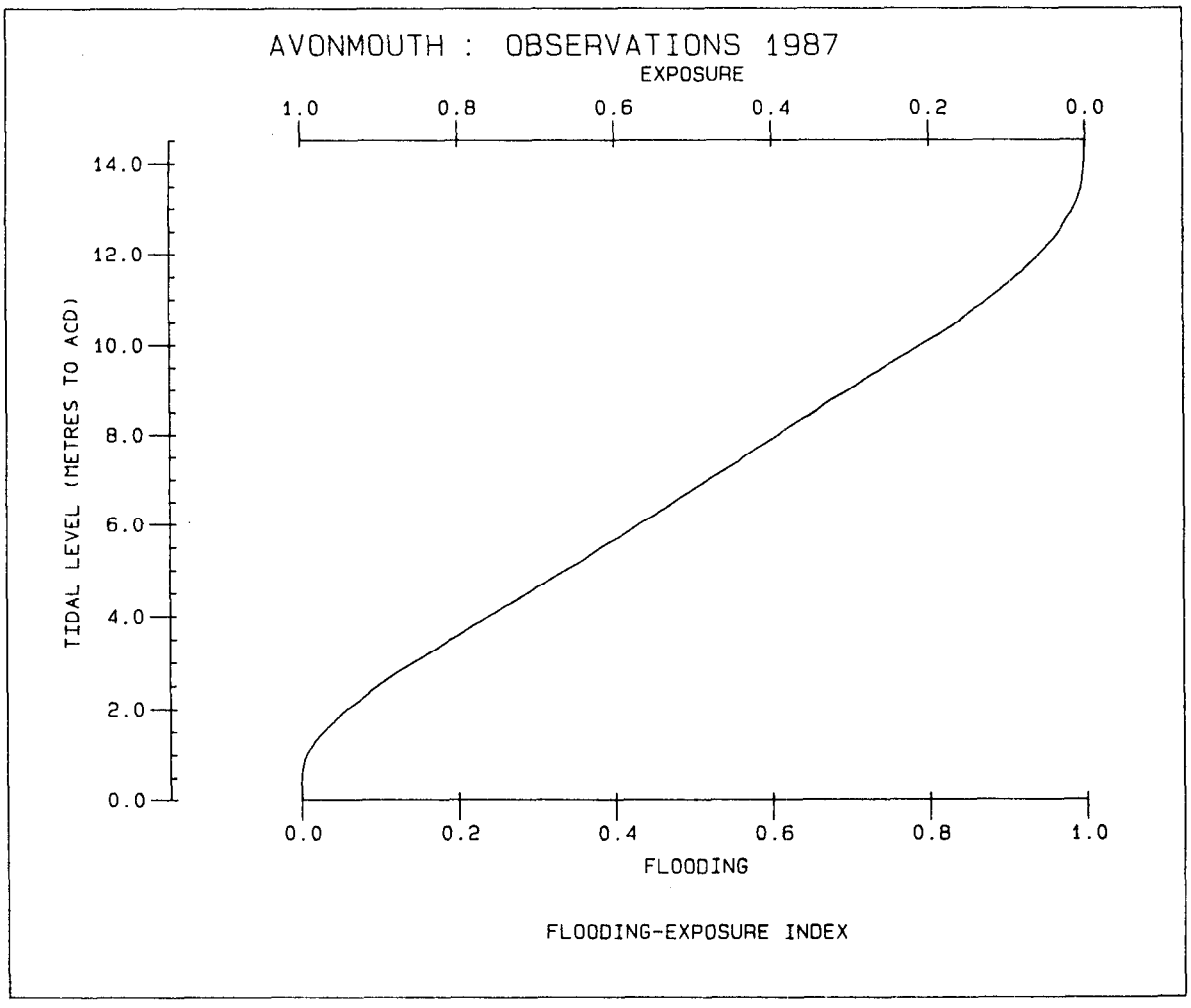
Filtered hourly levels
.....

Gaps 1200gmt 14 Jan. to 2000gmt 16 Jan.....compressor failure
0800gmt 27 Apr. to 0300gmt 01 May.....memory failure at site
0400gmt 08 Jul. to 1200gmt 14 Jul.....memory failure at site
1900gmt 01 Dec. to 0200gmt 16 Dec.....problems with gas condensing and freezing in tubing.

Site diary
.....

2 March TGI visit for routine maintenance and checks on Dataring system.


AVONMOUTH : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 6.897
STD DEV 3.255
MIN 0.462
MAX 14.329
% FREQUENCY
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
LEVEL


AVONMOUTH : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, WEST COAST - PORT OF BRISTOL (AVONMOUTH)

LATITUDE: 51 30' N

LONGITUDE: 2 43' W

TIME ZONE: GMT

LENGTH: 370 DAYS

FROM: 1ST DECEMBER, 1986 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 6.908

HOURLY DATA FROM DIGIQUARTZ GAUGE 2

DATUM OF OBSERVATIONS = ACD : 6.50 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.6908D+01 RESIDUAL MEAN = 0.1296D-05
STD = 0.3256D+01 STD = 0.2174D+00

	H	G		H	G		H	G		H	G
SA	0.105	208.31	2Q1	0.013	277.12	OQ2	0.048	76.98	MO3	0.010	117.34
SSA	0.043	50.50	SIGMA1	0.006	146.33	MNS2	0.108	234.19	M3	0.041	212.86
MM	0.049	77.74	Q1	0.029	323.22	2N2	0.224	151.92	SO3	0.012	190.72
MSF	0.123	39.05	RHO1	0.010	306.16	MU2	0.488	257.76	MK3	0.025	235.01
MF	0.012	45.68	O1	0.075	0.78	N2	0.754	187.79	SK3	0.027	322.04
			MP1	0.011	237.07	NU2	0.208	150.03			
			M1	0.016	162.50	OP2	0.058	158.00	MN4	0.117	333.95
			CHI1	0.009	80.62	M2	4.302	200.09	M4	0.246	348.64
			PI1	0.001	219.01	MKS2	0.060	324.97	SN4	0.068	28.49
			P1	0.027	134.58	LAMDA2	0.179	185.04	MS4	0.231	18.94
			S1	0.014	89.06	*L2	0.283	199.61	MK4	0.062	19.20
			K1	0.064	146.72	T2	0.084	246.58	S4	0.072	96.30
			PSI1	0.003	141.31	S2	1.537	258.97	SK4	0.041	94.42
			PHI1	0.004	70.87	R2	0.008	175.96			
			THETA1	0.009	168.80	K2	0.449	255.33	2MN6	0.061	245.28
			J1	0.002	253.03	MSN2	0.123	43.73	M6	0.123	270.26
			SO1	0.003	323.46	KJ2	0.040	161.50	MSN6	0.037	1.69
			OO1	0.003	208.07	2SM2	0.151	75.78	2MS6	0.163	323.05
									2MK6	0.037	324.15
									2SM6	0.045	63.27
									MSK6	0.025	65.19

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, WEST COAST - PORT OF BRISTOL (AVONMOUTH)
SPAN OF DATA FROM 1ST DECEMBER, 1986 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.015	340.23
3M(SK)2	26.87018	0.068	23.19
3M2S2	26.95231	0.114	18.52
SNK2	28.35759	0.016	61.65
2SK2	29.91786	0.018	174.49
MQ3	42.38277	0.012	78.77
2MP3	43.00928	0.013	328.32
2MQ3	44.56955	0.009	264.74
3MK4	56.87018	0.022	58.33
3MS4	56.95231	0.087	323.40
2MSK4	57.88607	0.017	51.91
3MK5	71.91124	0.005	70.54
M5	72.46026	0.014	342.09
3MO5	73.00928	0.003	342.18
2(MN)S6	84.84767	0.020	323.76
3MNS6	85.39204	0.027	326.52
4MK6	85.85428	0.023	16.37
4MS6	85.93642	0.053	345.35
2MSNK6	86.32580	0.010	78.47
2MV6	86.48079	0.041	193.00
3MSK6	86.87018	0.023	75.77
4MN6	87.49669	0.043	83.87
3MSN6	88.51258	0.053	153.33
MKL6	88.59472	0.007	328.15
2(MN)8	114.84767	0.007	3.26
3MN8	115.39204	0.008	35.50
M8	115.93642	0.017	38.06
2MSN8	116.40794	0.018	71.61
3MS8	116.95231	0.026	45.47
3MK8	117.03445	0.006	90.09
MSNK8	117.50597	0.010	87.70
2(MS)8	117.96821	0.022	125.04
2MSK8	118.05035	0.011	133.63
4MS10	145.93642	0.011	77.35
3M2S10	146.95231	0.009	136.01
4MSN12	174.37615	0.001	166.41
5MS12	174.92052	0.001	169.44
4M2S12	175.93642	0.001	202.62
MVS2	27.49669	0.061	217.96
MA2	28.94304	0.044	130.35
MB2	29.02517	0.051	175.39
MSV2	30.47152	0.025	210.91
SKM2	31.09803	0.082	68.53
2MNS4	56.40794	0.027	305.52
MV4	57.49669	0.008	153.29
3MN4	58.51258	0.029	109.19
2MSN4	59.52848	0.029	327.16
NA2	28.39866	0.007	101.03
NB2	28.48080	0.004	201.60
MSO5	72.92714	0.002	270.67
MSK5	74.02517	0.007	347.70

2.4 HOLYHEAD Primary DQ Channel 2
Secondary Pot. Channel 1 (Munro gauge well)

TGZ = ACD = 3.05m below ODN
TGZ = 7.447m below TGBM

Details of Tide Gauge Bench Mark
.....

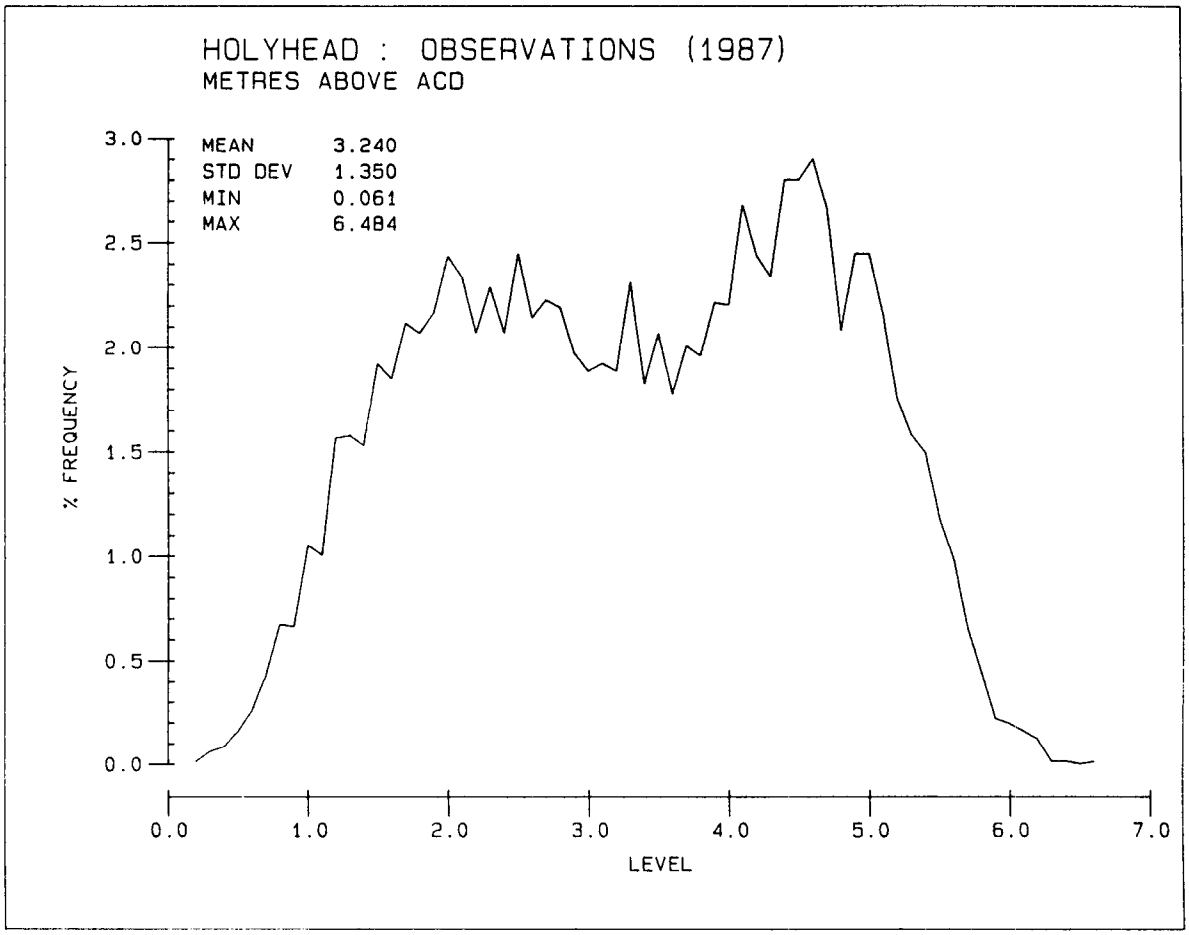
OSBM in concrete foundation, North side of Tide Gauge building.
National Grid reference SH 2553 8287

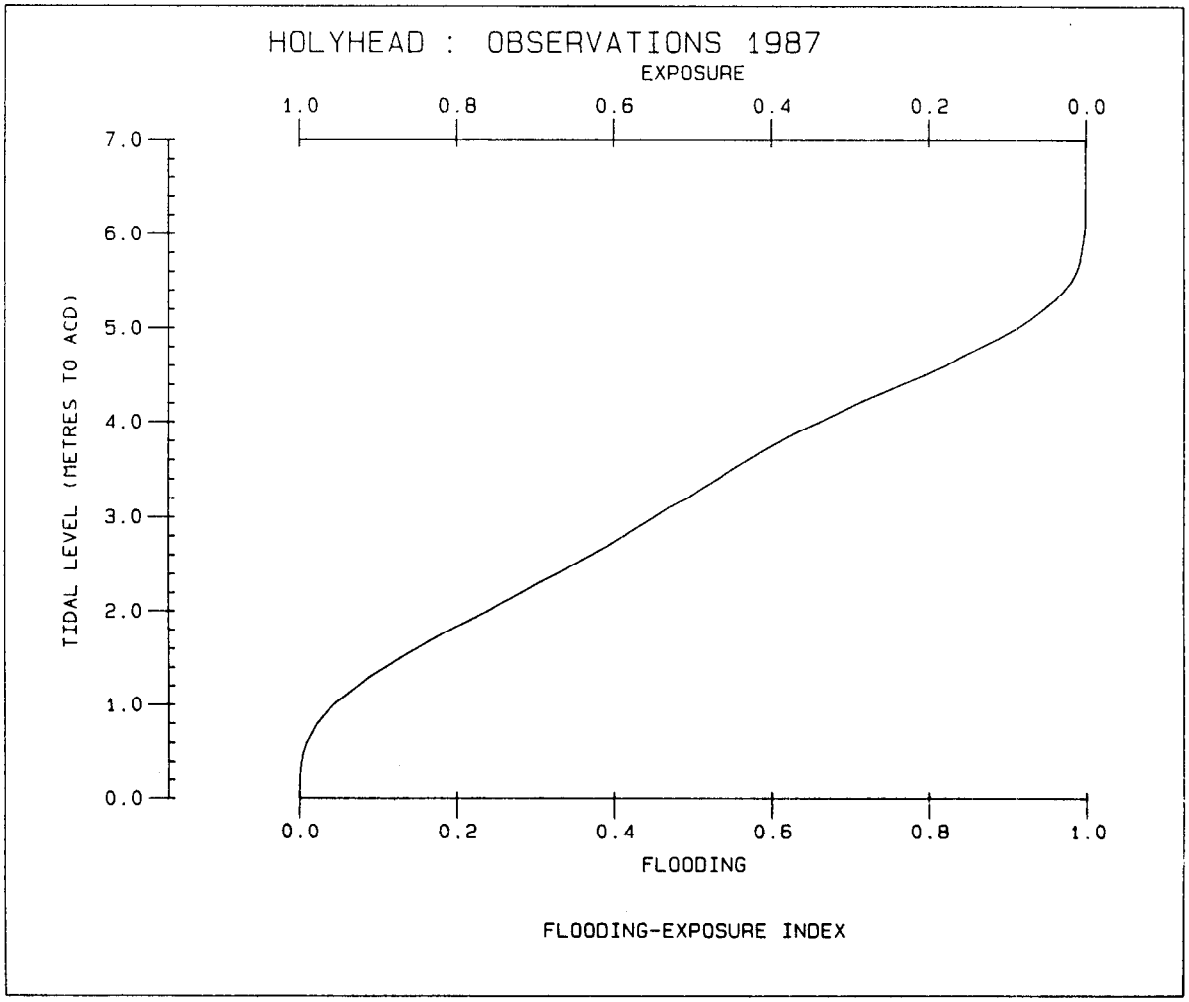
Filtered hourly levels
.....

Gaps 0001gmt 24 May to 1400gmt 17 Jun.....modem problems
Unit brought back to Bidston for repair

Site diary
.....

08 June TGI visit to investigate Dataring unit fault
17 June TGI visit. Unit replaced


HOLYHEAD : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 3.240
STD DEV 1.350
MIN 0.061
MAX 6.484
% FREQUENCY
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0
LEVEL


HOLYHEAD : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: WALES - HOLYHEAD

LATITUDE: 53 18' 27.1" N

LONGITUDE: 4 37' 48.0" W

TIME ZONE: GMT

LENGTH: 361 DAYS

FROM: 11TH DECEMBER, 1986 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 3.236

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 3.05 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.3246D+01 RESIDUAL MEAN = 0.2851D-06
STD = 0.1346D+01 STD = 0.1498D+00

	H	G		H	G		H	G		H	G
SA	0.104	219.87	2Q1	0.015	287.09	OQ2	0.008	221.45	MO3	0.003	321.99
SSA	0.033	42.96	SIGMA1	0.001	49.40	MNS2	0.007	127.39	M3	0.020	245.06
MM	0.056	139.55	Q1	0.043	336.43	2N2	0.053	266.53	SO3	0.002	295.07
MSF	0.050	246.96	RHO1	0.014	330.62	MU2	0.034	183.97	MK3	0.001	30.67
MF	0.021	218.52	O1	0.101	27.95	N2	0.362	267.12	SK3	0.004	50.06
			MP1	0.012	275.26	NU2	0.077	273.93			
			M1	0.003	238.35	OP2	0.004	358.72	MN4	0.013	356.30
			CHI1	0.004	132.79	M2	1.800	291.93	M4	0.034	29.85
			PI1	0.002	113.89	MKS2	0.003	123.81	SN4	0.001	340.16
			P1	0.037	172.63	LAMDA2	0.029	323.41	MS4	0.012	48.85
			S1	0.009	121.74	*L2	0.066	83.75	MK4	0.003	51.58
			K1	0.104	176.89	T2	0.033	321.73	S4	0.002	75.17
			PSI1	0.006	116.68	S2	0.596	328.70	SK4	0.001	58.38
			PHI1	0.001	337.50	R2	0.005	330.37			
			THETA1	0.003	187.25	K2	0.169	326.89	2MN6	0.012	195.64
			J1	0.004	273.08	MSN2	0.016	174.94	M6	0.021	224.69
			SO1	0.004	347.66	KJ2	0.008	156.97	MSN6	0.004	220.48
			OO1	0.001	179.33	2SM2	0.017	222.37	2MS6	0.019	263.64
									2MK6	0.005	263.22
									2SM6	0.004	291.13
									MSK6	0.003	292.57

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR WALES - HOLYHEAD
SPAN OF DATA FROM 11TH DECEMBER, 1986 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.003	171.61
3M(SK)2	26.87018	0.007	226.73
3M2S2	26.95231	0.009	231.18
SNK2	28.35759	0.002	237.19
2SK2	29.91786	0.001	325.90
MQ3	42.38277	0.002	245.08
2MP3	43.00928	0.001	264.94
2MQ3	44.56955	0.002	252.88
3MK4	56.87018	0.003	122.69
3MS4	56.95231	0.005	168.37
2MSK4	57.88607	0.001	255.39
3MK5	71.91124	0.002	305.80
M5	72.46026	0.001	302.83
3MO5	73.00928	0.003	73.08
2(MN)S6	84.84767	0.002	342.70
3MNS6	85.39204	0.002	337.71
4MK6	85.85428	0.003	325.25
4MS6	85.93642	0.003	26.88
2MV6	86.48079	0.004	205.00
3MSK6	86.87018	0.001	38.83
4MN6	87.49669	0.004	54.11
3MSN6	88.51258	0.004	117.22
MKL6	88.59472	0.001	303.40
3MN8	115.39204	0.001	31.27
M8	115.93642	0.001	62.01
3MS8	116.95231	0.001	24.44
4MS10	145.93642	0.001	182.09
MVS2	27.49669	0.004	83.95
MA2	28.94304	0.006	269.49
MB2	29.02517	0.004	285.66
MSV2	30.47152	0.002	27.35
SKM2	31.09803	0.006	220.81
2MNS4	56.40794	0.002	121.02
MV4	57.49669	0.004	14.01
3MN4	58.51258	0.002	230.42
2MSN4	59.52848	0.001	81.03
NA2	28.39866	0.003	89.16
NB2	28.48080	0.002	203.56
MSO5	72.92714	0.002	105.06
MSK5	74.02517	0.001	41.43

2.5 MILLPORT Primary DQ
Secondary Pot on pneumatic system, Channel 1

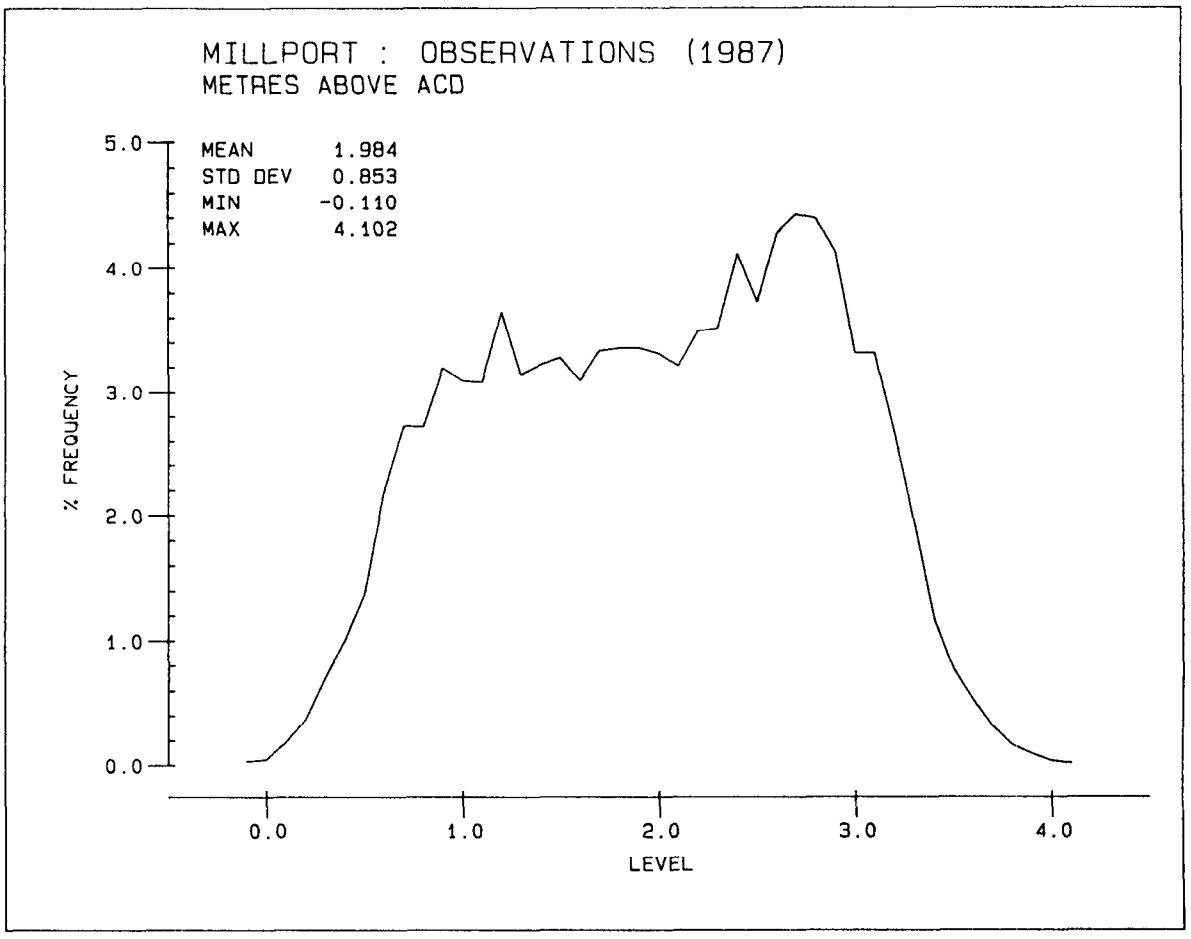
TGZ = ACD = 1.62m below ODN
TGZ = 7.82m below TGBM

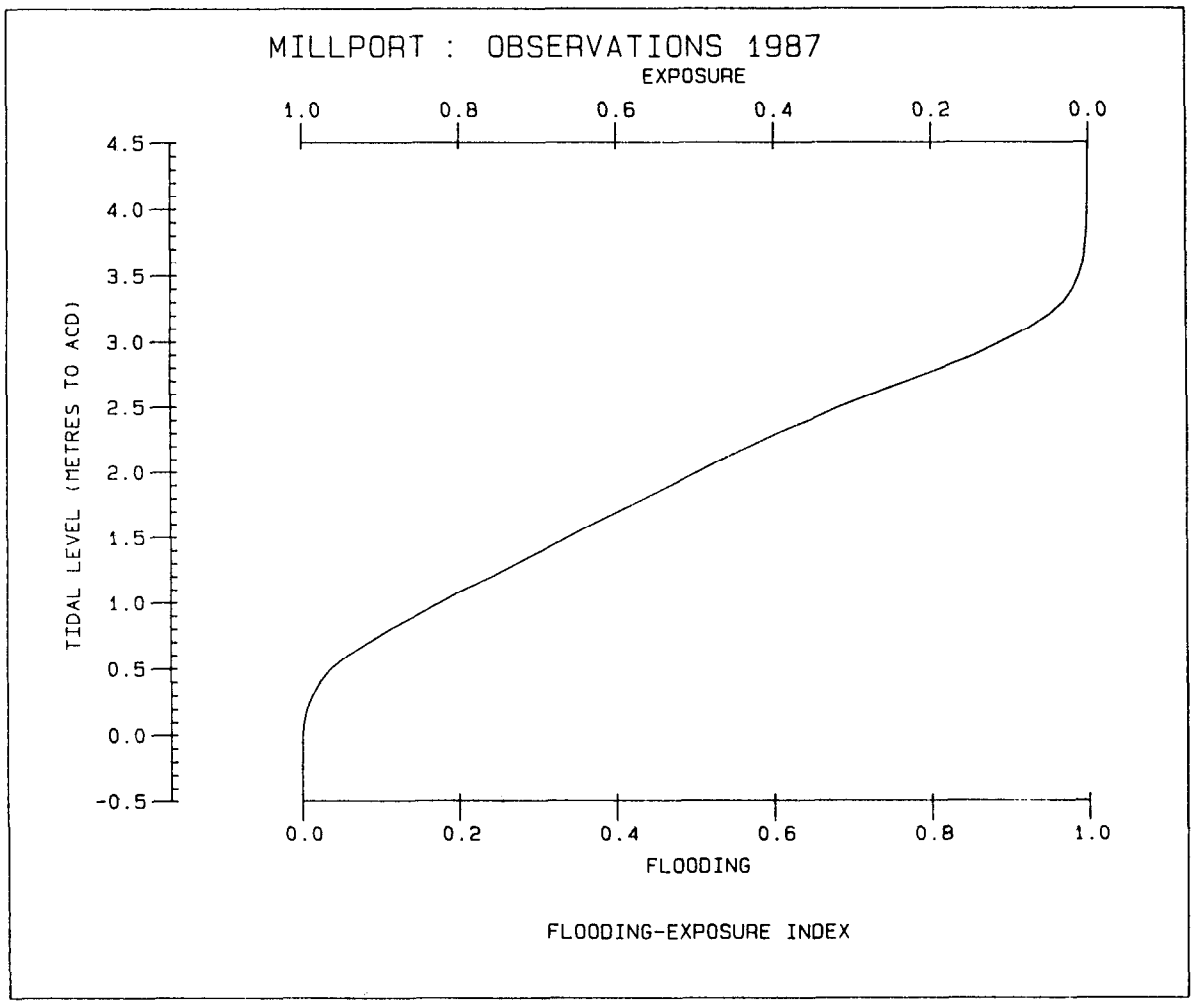
Details of Tide Gauge Bench Mark
.....

Flush Bracket G4602 on south angle NE wing of marine station building
National Grid reference NS 1757 5449

Filtered hourly heights
.....

Gaps 0300gmt 14 Jan. to 1900gmt 16 Jan.....loss of pressure by compressor.


MILLPORT : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 1.984
STD DEV 0.853
MIN -0.110
MAX 4.102
% FREQUENCY
5.0
4.0
3.0
2.0
1.0
0.0
0.0
1.0
2.0
3.0
4.0
LEVEL


MILLPORT : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: SCOTLAND, WEST COAST - MILLPORT

LATITUDE: 55 45' 00.0" N

LONGITUDE: 4 54' 15.0" W

TIME ZONE: GMT

LENGTH: 363 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 1.985

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 1.62 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.1985D+01 RESIDUAL MEAN = 0.5661D-06
STD = 0.8508D+00 STD = 0.1768D+00

	H	G		H	G		H	G		H	G
SA	0.112	223.77	2Q1	0.014	292.98	OQ2	0.009	260.54	MO3	0.005	50.24
SSA	0.029	27.64	SIGMA1	0.001	356.29	MNS2	0.011	87.86	M3	0.052	101.24
MM	0.040	149.67	Q1	0.043	341.40	2N2	0.043	314.63	SO3	0.008	152.86
MSF	0.013	245.43	RHO1	0.011	330.59	MU2	0.035	117.06	MK3	0.021	201.11
MF	0.016	272.85	O1	0.098	44.15	N2	0.210	315.24	SK3	0.020	279.35
			MP1	0.009	275.61	NU2	0.057	315.78			
			M1	0.002	275.65	OP2	0.007	346.95	MN4	0.038	80.59
			CHI1	0.003	97.23	M2	1.116	342.31	M4	0.088	89.90
			PI1	0.006	214.40	MKS2	0.009	145.10	SN4	0.011	68.50
			P1	0.040	188.59	LAMDA2	0.037	1.64	MS4	0.088	118.51
			S1	0.009	105.52	*L2	0.061	4.65	MK4	0.025	121.33
			K1	0.108	193.15	T2	0.019	27.57	S4	0.016	195.52
			PSI1	0.008	145.55	S2	0.298	34.91	SK4	0.008	200.28
			PHI1	0.001	359.77	R2	0.004	38.28			
			THETA1	0.002	206.04	K2	0.089	34.71	2MN6	0.011	273.42
			J1	0.005	297.30	MSN2	0.023	231.05	M6	0.024	303.24
			SO1	0.002	3.76	KJ2	0.005	340.32	MSN6	0.006	284.56
			OO1			2SM2	0.027	264.96	2MS6	0.027	350.68
									2MK6	0.007	347.95
									2SM6	0.004	13.72
									MSK6	0.003	9.69

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR SCOTLAND, WEST COAST - MILLPORT
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.002	224.53
3M(SK)2	26.87018	0.008	239.42
3M2S2	26.95231	0.012	240.77
SNK2	28.35759	0.002	273.56
2SK2	29.91786	0.003	18.21
MQ3	42.38277	0.004	15.17
2MP3	43.00928	0.006	344.14
2MQ3	44.56955	0.004	147.32
3MK4	56.87018	0.011	208.89
3MS4	56.95231	0.011	235.52
2MSK4	57.88607	0.003	286.37
3MK5	71.91124	0.004	98.25
M5	72.46026	0.005	50.19
3MO5	73.00928	0.005	210.92
2(MN)S6	84.84767	0.002	104.58
3MNS6	85.39204	0.005	60.05
4MK6	85.85428	0.003	51.34
4MS6	85.93642	0.007	115.96
2MSNK6	86.32580	0.001	72.20
2MV6	86.48079	0.006	303.52
3MSK6	86.87018	0.002	138.94
4MN6	87.49669	0.006	141.23
3MSN6	88.51258	0.007	219.63
MKL6	88.59472	0.001	43.52
2(MN)8	114.84767	0.001	45.58
3MN8	115.39204	0.002	48.18
M8	115.93642	0.002	77.66
2MSN8	116.40794	0.001	99.96
3MS8	116.95231	0.003	127.58
3MK8	117.03445	0.001	129.89
MSNK8	117.50597	0.001	193.66
2(MS)8	117.96821	0.001	183.18
2MSK8	118.05035	0.001	189.14
4MS10	145.93642	0.001	160.51
MVS2	27.49669	0.005	90.48
MA2	28.94304	0.004	321.45
MB2	29.02517	0.003	14.00
MSV2	30.47152	0.004	68.26
SKM2	31.09803	0.013	256.82
2MNS4	56.40794	0.004	158.33
MV4	57.49669	0.009	78.36
3MN4	58.51258	0.004	225.36
2MSN4	59.52848	0.009	169.99
NA2	28.39866	0.002	65.41
NB2	28.48080	0.001	244.70
MSO5	72.92714	0.003	247.95
MSK5	74.02517	0.005	200.07

2.6 STORNOWAY Primary DQ Channel 2

Secondary Pot on pneumatic system Channel 1 (Ott gauge well)

TGZ = ACD = 2.71m below ODL
TGZ = 6.37m below TGBM

Details of Tide Gauge Bench Mark
.....

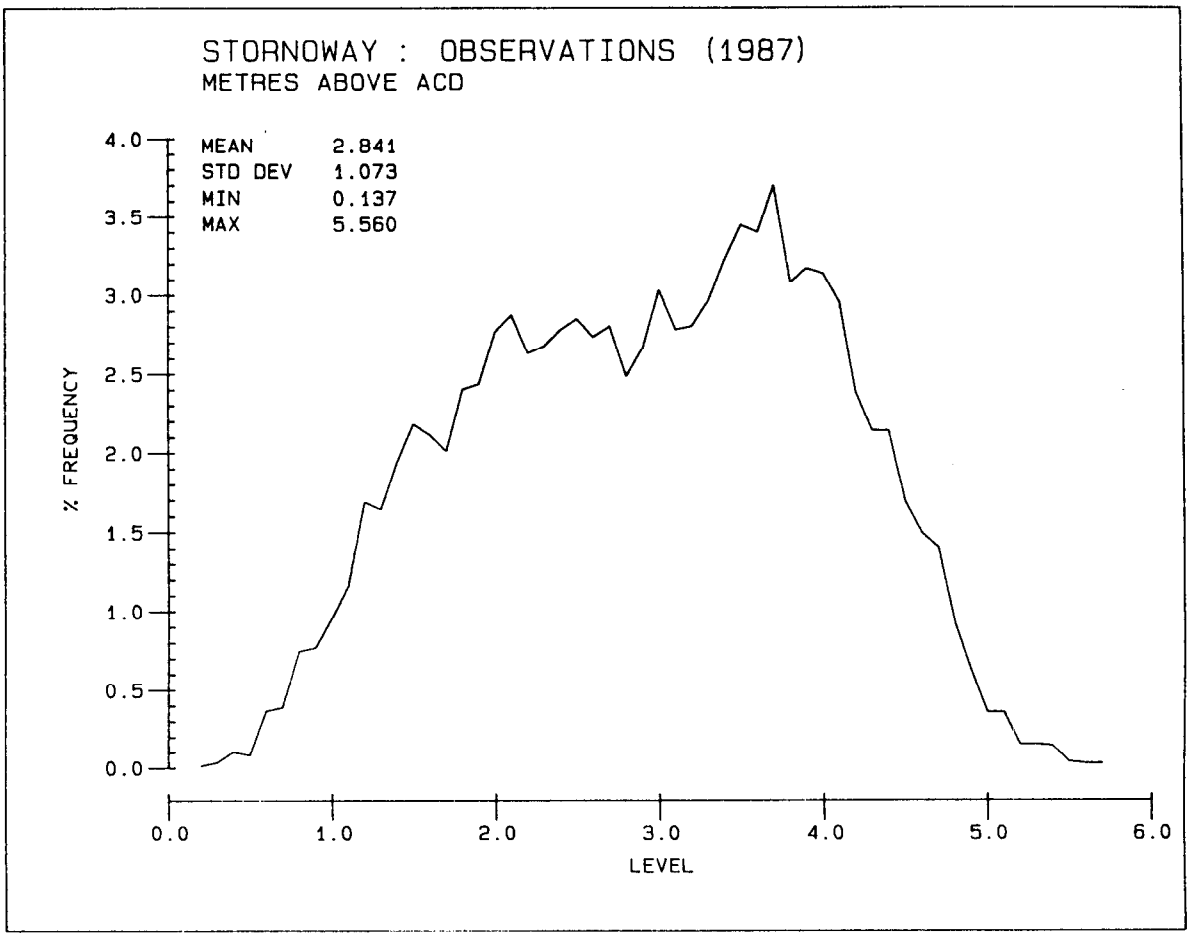
OSBM Bolt quay E.side Bank St.Wharf
National Grid reference NB 4228 3264

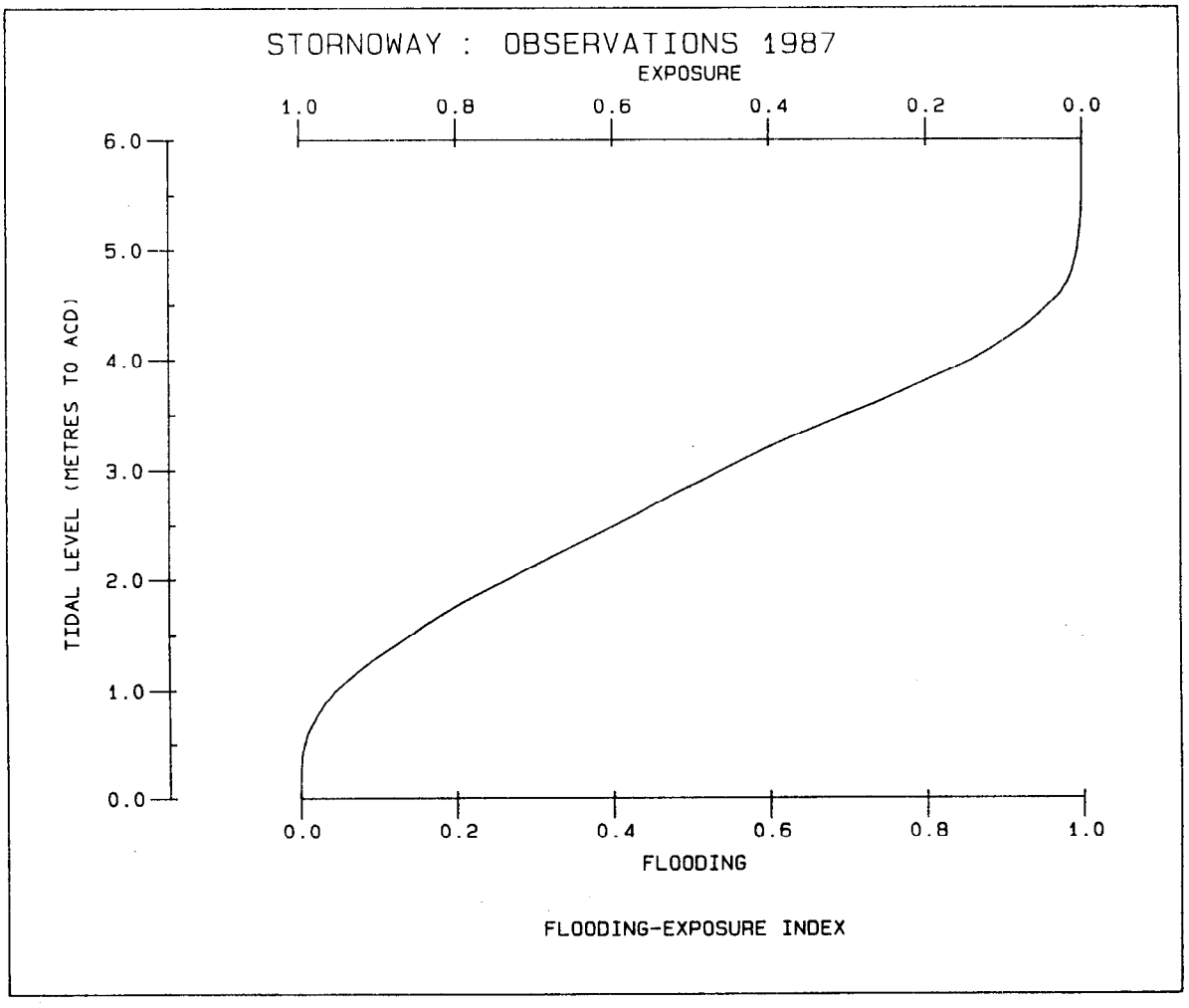
Filtered hourly levels
.....

Gaps 0700gmt 21 Apr. to 2300gmt 22 Apr.....Problems at site
0800gmt to 2200gmt 29 Apr. Problems at site

Site diary
.....

29-30 April	TGI visit. Calibration checks on Dataring sensors. A scaling error on the Ott Pneumatic (Channel 1) was found and rectified.
05 June	Operator adjusted flow control
17 June	Operator adjusted flow control
28 July	" " " "
13 Aug.	" " " "
03 Dec.	TGI visit. Faulty flow meter replaced


STORNOWAY : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 2.841
STD DEV 1.073
MIN 0.137
MAX 5.560
% FREQUENCY
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
LEVEL


STORNOWAY : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: SCOTLAND, WEST COAST - STORNOWAY

LATITUDE: 58 12' N

LONGITUDE: 6 23' W

TIME ZONE: GMT

LENGTH: 363 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 2.842

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 2.71 METRES BELOW ORDNANCE DATUM (LOCAL)

OBSERVATION MEAN = 0.2842D+01 RESIDUAL MEAN = 0.6889D-06
STD = 0.1072D+01 STD = 0.1539D+00

	H	G		H	G		H	G		H	G
SA	0.133	218.93	2Q1	0.009	255.88	OQ2	0.002	98.81	MO3	0.001	195.73
SSA	0.035	29.65	SIGMA1	0.007	278.17	MNS2	0.012	114.17	M3	0.028	110.57
MM	0.023	147.22	Q1	0.039	295.92	2N2	0.032	161.04	SO3	0.004	158.53
MSF	0.011	204.20	RHO1	0.007	302.76	MU2	0.055	144.69	MK3	0.012	196.80
MF	0.008	252.12	O1	0.094	349.66	N2	0.286	175.94	SK3	0.009	259.06
			MP1	0.003	189.47	NU2	0.051	179.73			
			M1	0.004	130.84	OP2	0.007	353.82	MN4	0.010	192.35
			CHI1	0.003	58.26	M2	1.375	197.67	M4	0.061	222.70
			PI1	0.002	151.60	MKS2	0.006	187.43	SN4	0.008	262.01
			P1	0.037	127.24	LAMDA2	0.005	203.91	MS4	0.074	296.63
			S1	0.008	40.80	*L2	0.032	219.52	MK4	0.020	294.83
			K1	0.129	136.95	T2	0.029	228.18	S4	0.014	27.12
			PSI1	0.004	290.78	S2	0.544	230.83	SK4	0.007	38.78
			PHI1	0.003	159.42	R2	0.001	290.75			
			THETA1	0.003	141.69	K2	0.154	228.94	2MN6	0.004	171.44
			J1	0.006	224.57	MSN2	0.003	280.17	M6	0.007	187.19
			SO1	0.001	98.03	KJ2	0.011	61.30	MSN6	0.002	157.19
			OO1	0.003	256.09	2SM2	0.005	247.35	2MS6	0.009	217.64
									2MK6	0.003	214.19
									2SM6	0.003	237.26
									MSK6	0.002	225.92

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR SCOTLAND, WEST COAST - STORNOWAY
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.001	45.74
3M(SK)2	26.87018	0.002	196.51
3M2S2	26.95231	0.002	177.14
SNK2	28.35759	0.002	90.38
2SK2	29.91786	0.001	12.30
MQ3	42.38277	0.001	34.23
2MP3	43.00928	0.003	357.48
2MQ3	44.56955	0.004	141.60
3MK4	56.87018	0.003	55.25
3MS4	56.95231	0.005	16.20
2MSK4	57.88607	0.002	100.45
3MK5	71.91124	0.003	202.31
M5	72.46026	0.001	169.86
3MO5	73.00928	0.003	41.89
2(MN)S6	84.84767	0.001	21.22
3MNS6	85.39204	0.001	357.09
4MK6	85.85428	0.001	308.46
4MS6	85.93642	0.002	36.72
2MV6	86.48079	0.002	190.16
4MN6	87.49669	0.001	17.89
3MSN6	88.51258	0.002	96.51
3MS8	116.95231	0.001	347.31
4MS10	145.93642	0.001	305.77
MVS2	27.49669	0.002	83.30
MA2	28.94304	0.002	215.25
MB2	29.02517	0.007	105.83
MSV2	30.47152	0.002	55.01
SKM2	31.09803	0.004	270.48
2MNS4	56.40794	0.004	309.93
MV4	57.49669	0.007	164.12
3MN4	58.51258	0.009	40.58
2MSN4	59.52848	0.006	341.20
NA2	28.39866	0.004	11.65
NB2	28.48080	0.002	221.33
MSO5	72.92714	0.001	345.51
MSK5	74.02517	0.002	293.26

2.7 WICK Primary DQ Channel 2
Secondary Pot Channel 1 (Lea gauge well)

TGZ = ACD = 1.71m below ODN
TGZ = 5.077m below TGBM

Details of Tide Gauge Bench Mark
.....

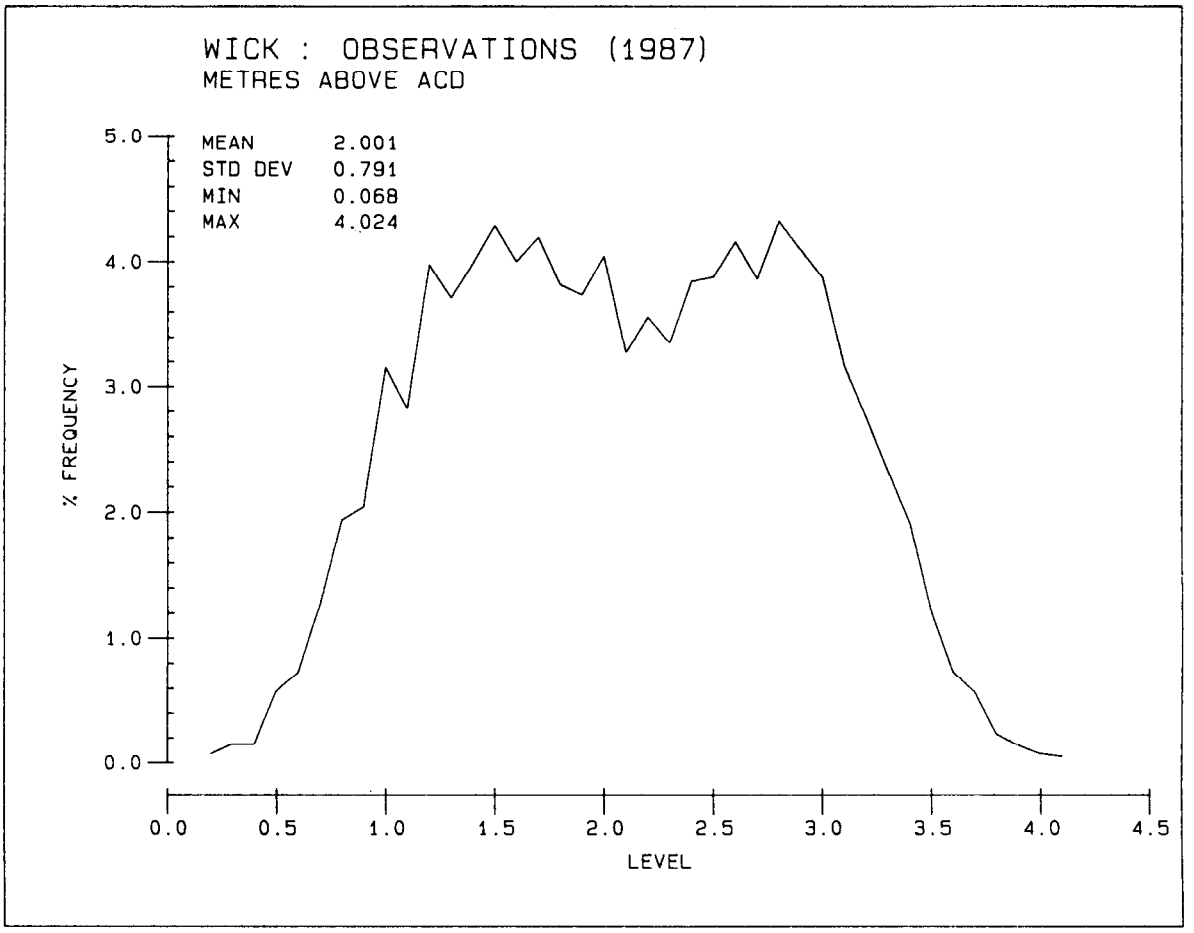
OSBM Bolt E. angle tide gauge building
National Grid reference ND 3667 5080

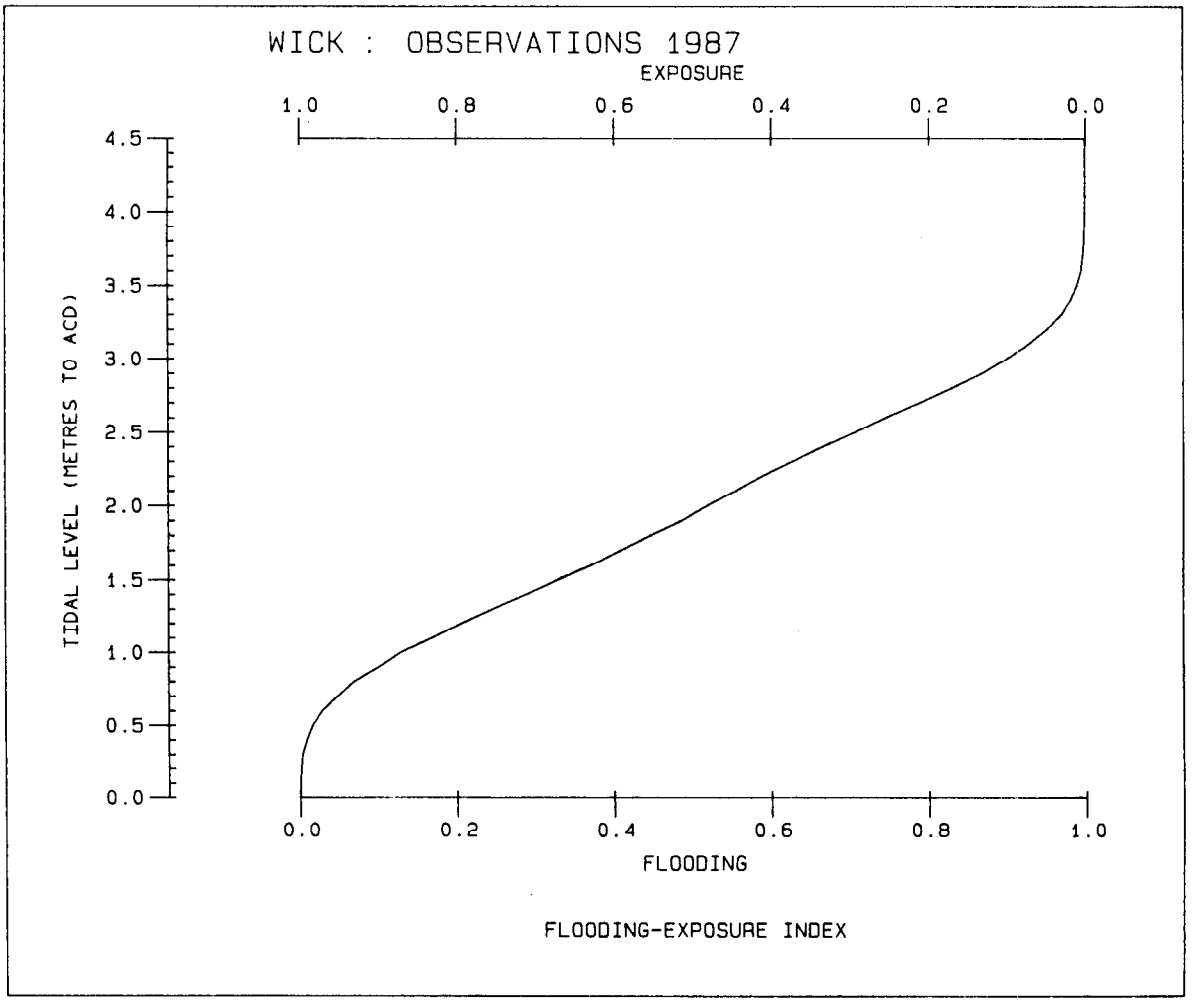
Filtered hourly levels
.....

Gaps 0001gmt 05 Mar. to 1100gmt 09 Mar.....memory loss at site

Site diary
.....

01 December TGI visit for routine maintenance


WICK : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 2.001
STD DEV 0.791
MIN 0.068
MAX 4.024
% FREQUENCY
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5
LEVEL


WICK : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: SCOTLAND, EAST COAST - WICK

LATITUDE: 58 26' 28.8" N

LONGITUDE: 3 05' 05.7" W

TIME ZONE: GMT

LENGTH: 356 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 2.002

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 1.71 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.2002D+01 RESIDUAL MEAN = 0.7959D-06
STD = 0.7894D+00 STD = 0.1447D+00

	H	G		H	G		H	G		H	G
SA	0.118	216.25	2Q1	0.009	282.96	OQ2	0.005	225.36	MO3	0.003	287.80
SSA	0.026	25.00	SIGMA1	0.005	325.04	MNS2	0.006	308.58	M3	0.013	228.28
MM	0.023	182.05	Q1	0.046	334.39	2N2	0.034	294.58	SO3	0.002	286.50
MSF	0.014	180.43	RHO1	0.008	352.80	MU2	0.019	305.94	MK3	0.005	12.27
MF	0.004	229.20	O1	0.115	27.69	N2	0.206	301.91	SK3	0.003	107.01
			MP1	0.005	263.74	NU2	0.042	304.23			
			M1	0.004	166.53	OP2	0.005	183.09	MN4	0.012	273.97
			CHI1	0.002	104.97	M2	1.014	322.82	M4	0.036	317.73
			PI1	0.002	162.61	MKS2	0.006	94.43	SN4	0.001	183.02
			P1	0.032	160.73	LAMDA2	0.015	306.58	MS4	0.021	53.74
			S1	0.007	95.73	*L2	0.038	333.41	MK4	0.006	55.12
			K1	0.108	177.25	T2	0.020	343.66	S4	0.002	282.01
			PSI1	0.001	31.98	S2	0.351	0.24	SK4	0.001	164.21
			PHI1	0.003	173.46	R2	0.007	28.94			
			THETA1	0.003	212.40	K2	0.096	358.02	2MN6	0.004	198.38
			J1	0.006	294.18	MSN2	0.006	127.89	M6	0.006	231.17
			SO1	0.001	26.76	KJ2	0.006	204.79	MSN6	0.002	206.34
			OO1	0.004	328.24	2SM2	0.007	147.69	2MS6	0.005	263.29
									2MK6	0.001	258.06
									2SM6	0.002	261.17
									MSK6	0.001	255.23

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR SCOTLAND, EAST COAST - WICK
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.002	192.23
3M(SK)2	26.87018	0.003	266.91
3M2S2	26.95231	0.007	279.87
SNK2	28.35759	0.001	229.37
2SK2	29.91786	0.001	38.27
MQ3	42.38277	0.001	326.42
2MP3	43.00928	0.001	241.04
2MQ3	44.56955	0.002	213.74
3MK4	56.87018	0.003	28.46
3MS4	56.95231	0.006	29.39
2MSK4	57.88607	0.001	136.18
3MK5	71.91124	0.001	20.87
M5	72.46026	0.001	174.66
3MO5	73.00928	0.001	149.78
2(MN)S6	84.84767	0.001	39.56
3MNS6	85.39204	0.001	54.09
4MK6	85.85428	0.001	352.05
4MS6	85.93642	0.002	93.37
2MV6	86.48079	0.001	243.38
4MN6	87.49669	0.001	91.10
3MSN6	88.51258	0.001	181.51
3MN8	115.39204	0.001	241.11
M8	115.93642	0.002	278.26
2MSN8	116.40794	0.002	327.88
3MS8	116.95231	0.004	338.23
3MK8	117.03445	0.001	333.21
MSNK8	117.50597	0.001	41.49
2(MS)8	117.96821	0.002	42.60
2MSK8	118.05035	0.001	41.97
4MS10	145.93642	0.002	220.04
3M2S10	146.95231	0.001	244.97
MVS2	27.49669	0.003	87.34
MA2	28.94304	0.009	348.91
MB2	29.02517	0.012	107.77
MSV2	30.47152	0.003	241.56
SKM2	31.09803	0.003	133.37
2MNS4	56.40794	0.002	336.51
MV4	57.49669	0.005	243.63
3MN4	58.51258	0.007	184.66
2MSN4	59.52848	0.003	80.56
NA2	28.39866	0.002	229.55
NB2	28.48080	0.003	214.28
MSO5	72.92714	0.001	331.58
MSK5	74.02517	0.001	347.65

2.8 ABERDEEN Primary DQ Channel 2
Secondary Pot Channel 1 (Munro gauge well)

TGZ = ACD = 2.25m below ODN
TGZ = 6.09m below TGBM

Details of Tide Gauge Bench Mark
.....

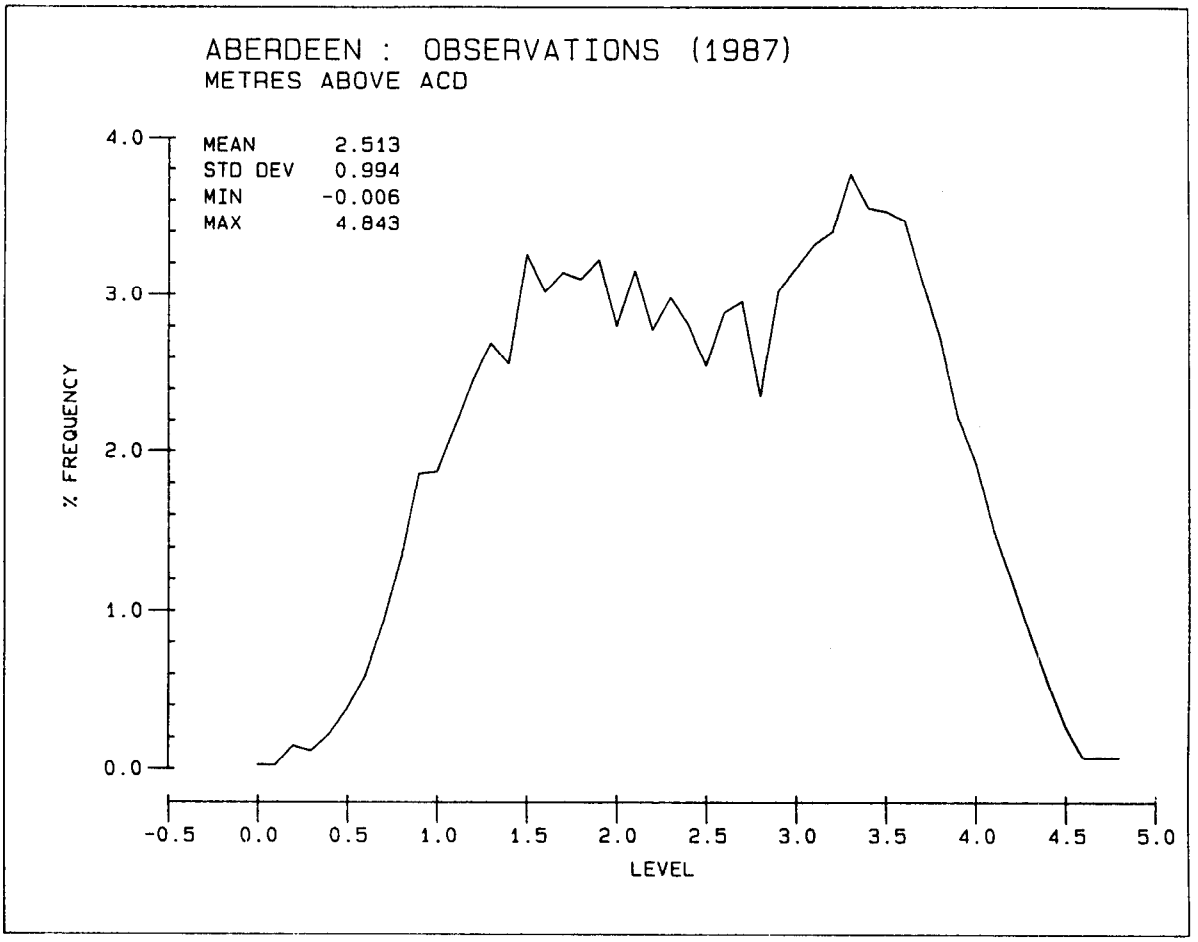
OSBM Bolt over concrete pile in quay, 4.8m SE production of SE face of tide gauge housing; SW inner angle of jetty.
National Grid reference NJ 9524 0590.

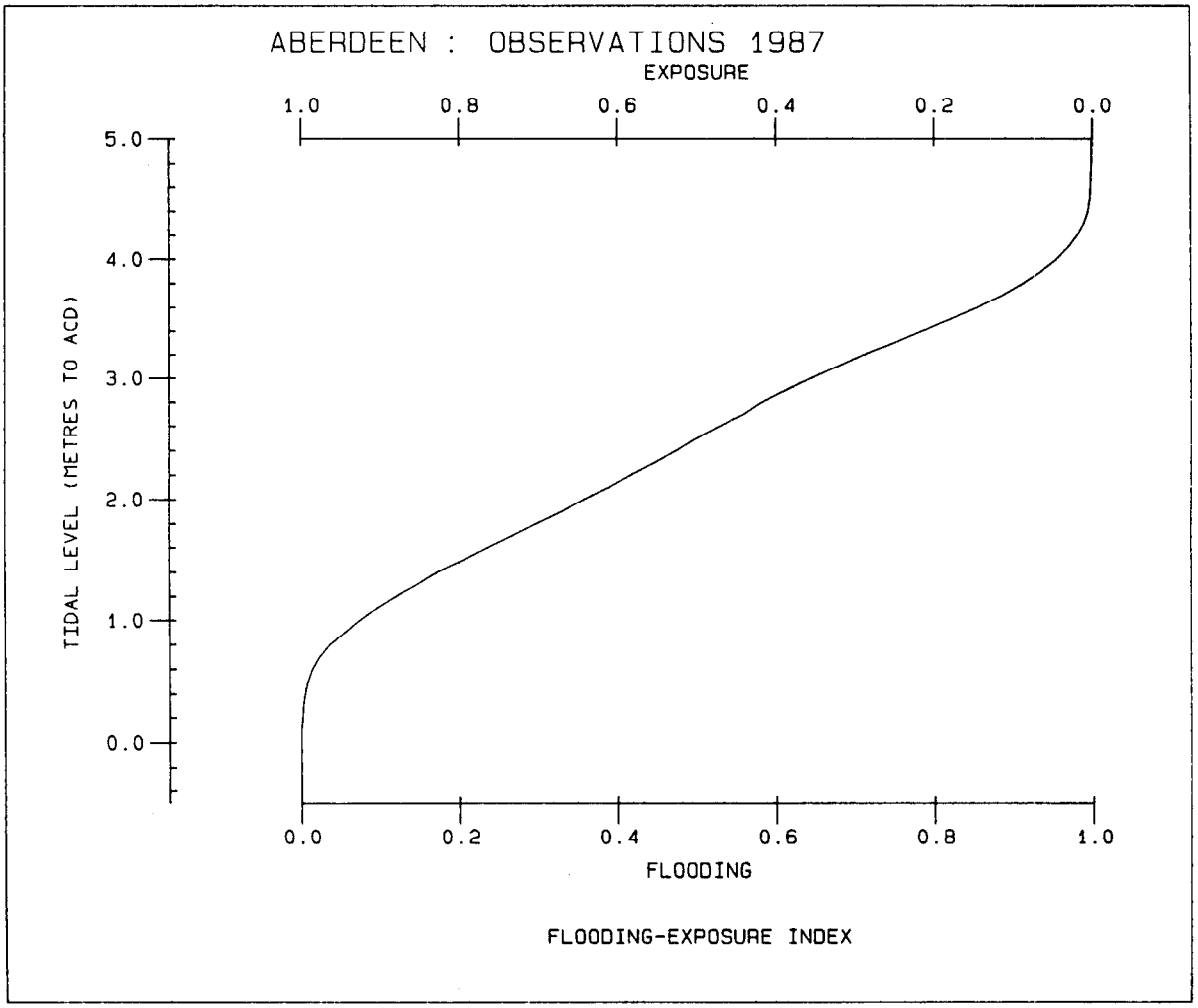
Filtered hourly levels
.....

Nil gaps

Site diary
.....

29 September Munro gauge well inlet cleaned
5-6 October " " " " "
Results showed marginal improvement. At a later date the well was pumped dry to remove large pieces of debris. Well inlet found to be at the bottom of the well and not a side entry as is customary with wells built into solid jetties.
The well now performs satisfactorily.
30 November TGI visit for routine maintenance.


ABERDEEN : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 2.513
STD DEV 0.994
MIN -0.006
MAX 4.843
% FREQUENCY
4.0
3.0
2.0
1.0
0.0
-0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
LEVEL


ABERDEEN : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: SCOTLAND, EAST COAST - ABERDEEN

LATITUDE: 57 08' 36.0" N

LONGITUDE: 2 04' 23.0" W

TIME ZONE: GMT

LENGTH: 365 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 2.515

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 2.25 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.2515D+01 RESIDUAL MEAN = 0.2724D-06
STD = 0.9917D+00 STD = 0.1371D+00

	H	G		H	G		H	G		H	G
SA	0.108	208.87	2Q1	0.009	306.45	OQ2	0.005	298.81	MO3	0.009	13.98
SSA	0.019	48.51	SIGMA1	0.005	335.61	MNS2	0.001	331.84	M3	0.012	323.31
MM	0.015	206.23	Q1	0.051	356.20	2N2	0.042	355.09	SO3	0.004	49.52
MSF	0.005	213.21	RHO1	0.010	22.21	MU2	0.021	315.20	MK3	0.008	134.89
MF	0.006	197.97	O1	0.129	50.28	N2	0.264	0.55	SK3	0.004	204.92
			MP1	0.005	247.99	NU2	0.053	8.15			
			M1	0.005	194.90	OP2	0.003	69.69	MN4	0.010	145.64
			CHI1	0.001	217.70	M2	1.300	24.48	M4	0.034	164.89
			PI1	0.004	153.68	MKS2	0.001	152.49	SN4	0.002	313.56
			P1	0.034	188.13	LAMDA2	0.017	40.41	MS4	0.031	242.23
			S1	0.009	118.89	*L2	0.048	47.12	MK4	0.009	238.33
			K1	0.110	205.58	T2	0.020	52.27	S4	0.003	0.36
			PSI1	0.002	87.00	S2	0.445	62.29	SK4	0.002	344.06
			PHI1	0.003	232.09	R2	0.004	119.08			
			THETA1	0.002	257.98	K2	0.125	60.27	2MN6	0.004	81.06
			J1	0.006	324.19	MSN2	0.005	238.59	M6	0.007	109.83
			SO1	0.001	164.89	KJ2	0.007	260.03	MSN6	0.001	1.15
			OO1	0.005	352.08	2SM2	0.004	264.06	2MS6	0.006	172.34
									2MK6	0.001	161.37
									2SM6	0.001	0.04
									MSK6		

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR SCOTLAND, EAST COAST - ABERDEEN
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.003	236.08
3M(SK)2	26.87018	0.006	326.49
3M2S2	26.95231	0.010	339.22
SNK2	28.35759	0.001	213.48
2SK2	29.91786	0.001	262.46
MQ3	42.38277	0.003	311.79
2MP3	43.00928	0.002	3.77
2MQ3	44.56955	0.003	321.29
3MK4	56.87018	0.003	267.89
3MS4	56.95231	0.007	230.67
2MSK4	57.88607	0.002	314.32
3MK5	71.91124	0.002	338.30
M5	72.46026	0.001	314.11
3MO5	73.00928	0.002	158.02
2(MN)S6	84.84767	0.001	192.58
3MNS6	85.39204	0.002	197.05
4MK6	85.85428	0.001	221.99
4MS6	85.93642	0.003	232.06
2MSNK6	86.32580	0.001	256.40
2MV6	86.48079	0.002	63.43
3MSK6	86.87018	0.001	298.27
4MN6	87.49669	0.003	315.39
3MSN6	88.51258	0.001	37.80
2(MN)8	114.84767	0.001	0.43
3MN8	115.39204	0.003	26.88
M8	115.93642	0.004	59.82
2MSN8	116.40794	0.002	104.09
3MS8	116.95231	0.006	119.27
3MK8	117.03445	0.002	121.13
MSNK8	117.50597	0.002	186.50
2(MS)8	117.96821	0.002	200.85
2MSK8	118.05035	0.001	205.74
4MS10	145.93642	0.002	82.94
3M2S10	146.95231	0.001	148.55
MVS2	27.49669	0.003	163.01
MA2	28.94304	0.007	323.92
MB2	29.02517	0.007	192.64
MSV2	30.47152	0.002	293.60
SKM2	31.09803	0.001	224.86
2MNS4	56.40794	0.002	198.62
MV4	57.49669	0.004	86.62
3MN4	58.51258	0.007	5.57
2MSN4	59.52848	0.004	258.21
NA2	28.39866	0.004	214.63
NB2	28.48080	0.002	308.10
MSO5	72.92714	0.002	167.64
MSK5	74.02517	0.001	127.34

2.9 NORTH SHIELDS Primary Pot Channel 2 (Munro gauge well)
Secondary Pot Channel 1 (Ott gauge well)

TGZ = ACD = 2.6m below ODN
TGZ = 6.515m below TGBM

Details of Tide Gauge Bench Mark
.....

Bolt in north corner of tide gauge hut
National Grid reference NZ 3592 6823

Filtered hourly heights
.....

Gaps: 1200gmt 11 May to 1700gmt 12 May (TGI visit)
2100gmt 19 Aug to 1100gmt 20 Aug (problem at central site)

Site diary
.....

February - March. Flat HWs were noticed on channel 2.
The fault was identified as being with the potentiometer connected to the Munro gauge.
Output from the channel deteriorated over the next two months, with many spikes requiring interpolation.

11-12 May TGI visit. Wires replaced on well-head unit with stainless steel in an effort to overcome recent problems with corrosion of float wires.
Dataring sensors calibrated.

11 September. Mains supply became intermittent.

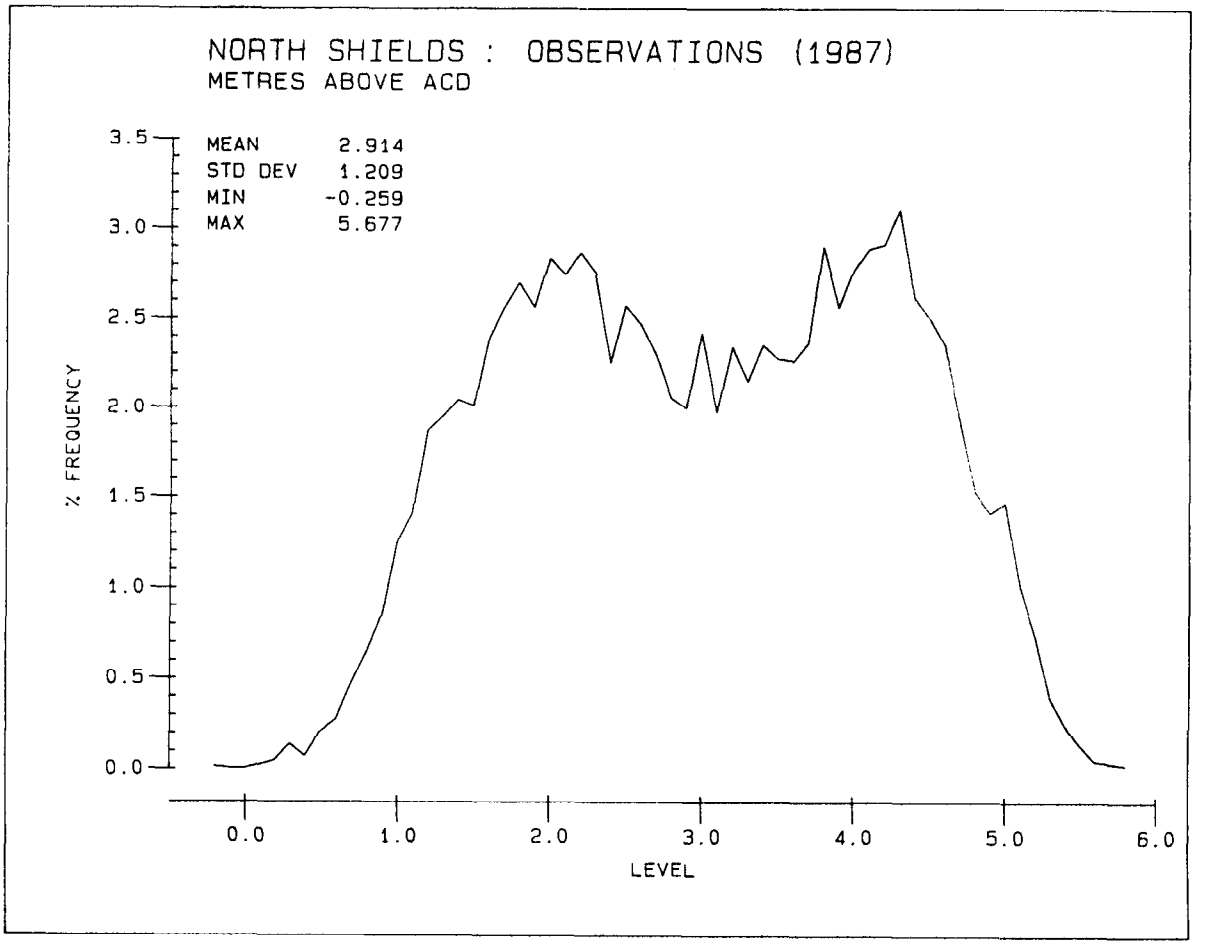
14 September. Mains supply lost due to a faulty supply cable.

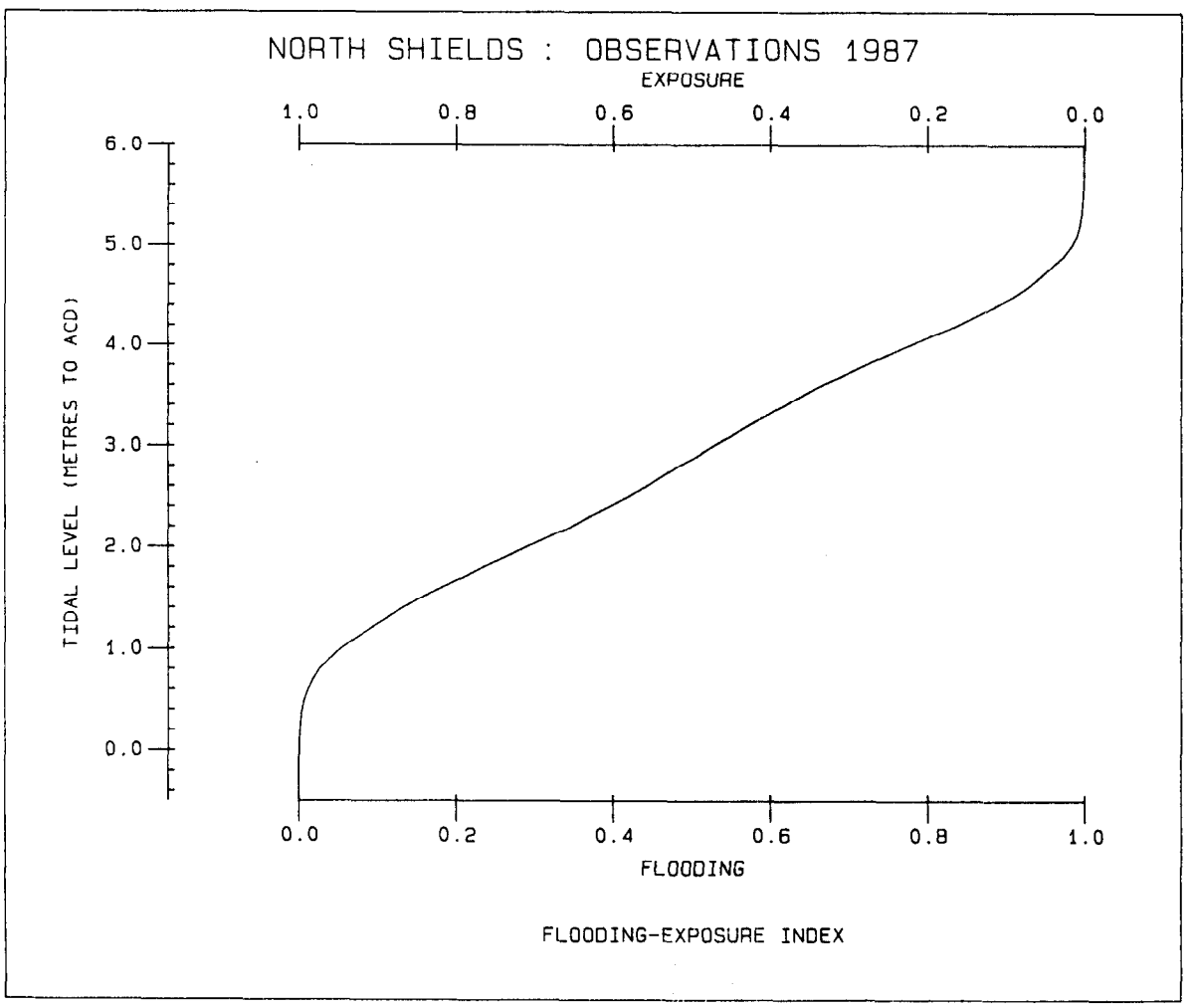
24 September. Power restored at 1630gmt. The dataring system functioned satisfactorily on batteries and there was no loss of data.

6 to 10 October. Channel 1 was jamming at low waters. It was found that the float wire was catching on the floorboards following the rectification of the electrical fault.

November/December. Failure of the mains power cable but system operated satisfactorily on external batteries for almost two weeks - no data lost.

10 December TGI visit. Batteries replaced and routine servicing.


NORTH SHIELDS : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 2.914
STD DEV 1.209
MIN -0.259
MAX 5.677
% FREQUENCY
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
LEVEL


NORTH SHIELDS : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, EAST COAST - NORTH SHIELDS

LATITUDE: 55 00' 12.3" N

LONGITUDE: 1 26' 35.0" W

TIME ZONE: GMT

LENGTH: 363 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 2.917

HOURLY DATA FROM POTENTIOMETER GAUGE 2

DATUM OF OBSERVATIONS = ACD : 2.60 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.2916D+01 RESIDUAL MEAN = -0.6678D-07
STD = 0.1210D+01 STD = 0.1379D+00

	H	G		H	G		H	G		H	G
SA	0.097	207.65	2Q1	0.010	345.06	OQ2	0.008	358.13	MO3	0.012	80.66
SSA	0.013	72.89	SIGMA1	0.004	349.27	MNS2	0.004	111.93	M3	0.017	57.42
MM	0.018	228.94	Q1	0.054	26.44	2N2	0.055	56.49	SO3	0.006	135.72
MSF	0.006	240.14	RHO1	0.011	53.82	MU2	0.015	48.85	MK3	0.013	227.31
MF	0.013	192.90	O1	0.140	80.34	N2	0.319	64.70	SK3	0.007	294.31
			MP1	0.005	257.93	NU2	0.067	69.65			
			M1	0.005	219.37	OP2	0.005	108.92	MN4	0.013	84.43
			CHI1	0.002	251.91	M2	1.601	89.00	M4	0.022	112.30
			PI1	0.004	155.17	MKS2	0.005	222.75	SN4	0.006	101.14
			P1	0.036	224.03	LAMDA2	0.027	101.36	MS4	0.018	83.12
			S1	0.008	168.26	*L2	0.066	110.17	MK4	0.005	76.85
			K1	0.117	243.97	T2	0.025	126.21	S4	0.006	157.25
			PSI1	0.003	114.65	S2	0.542	130.57	SK4	0.003	153.95
			PHI1	0.006	275.22	R2	0.006	179.96			
			THETA1	0.002	317.42	K2	0.153	128.97	2MN6	0.005	356.83
			J1	0.007	4.76	MSN2	0.010	311.43	M6	0.007	12.46
			SO1	0.001	208.82	KJ2	0.008	332.81	MSN6	0.002	140.43
			OO1	0.005	22.58	2SM2	0.010	342.23	2MS6	0.009	87.28
									2MK6	0.002	64.00
									2SM6	0.003	198.34
									MSK6	0.001	206.70

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, EAST COAST - NORTH SHIELDS
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.002	279.21
3M(SK)2	26.87018	0.006	4.73
3M2S2	26.95231	0.011	21.51
SNK2	28.35759	0.002	273.77
2SK2	29.91786	0.002	328.01
MQ3	42.38277	0.004	13.90
2MP3	43.00928	0.001	133.54
2MQ3	44.56955	0.003	44.27
3MK4	56.87018	0.002	209.61
3MS4	56.95231	0.005	335.66
2MSK4	57.88607	0.001	12.66
3MK5	71.91124	0.003	157.27
M5	72.46026	0.002	129.97
3MO5	73.00928	0.003	349.04
2(MN)S6	84.84767	0.001	20.00
3MNS6	85.39204	0.002	31.31
4MK6	85.85428	0.001	117.39
4MS6	85.93642	0.004	73.68
2MV6	86.48079	0.003	289.60
3MSK6	86.87018	0.001	172.07
4MN6	87.49669	0.004	201.74
3MSN6	88.51258	0.003	270.81
2(MN)8	114.84767	0.001	219.53
3MN8	115.39204	0.001	235.08
M8	115.93642	0.002	275.89
2MSN8	116.40794	0.001	245.10
3MS8	116.95231	0.002	308.61
MVS2	27.49669	0.004	199.96
MA2	28.94304	0.010	353.18
MB2	29.02517	0.010	227.71
MSV2	30.47152	0.001	17.33
SKM2	31.09803	0.003	324.31
2MNS4	56.40794	0.002	288.70
MV4	57.49669	0.004	106.65
3MN4	58.51258	0.002	114.45
2MSN4	59.52848	0.002	33.52
NA2	28.39866	0.004	257.53
NB2	28.48080	0.001	5.23
MSO5	72.92714	0.002	19.67
MSK5	74.02517	0.001	335.69

2.10 IMMINGHAM Primary DQ Channel 2
Secondary Pot. Channel 1 (Munro gauge well)

TGZ = ACD = 3.9m below ODN
TGZ = 9.131m below TGBM

Details of Tide Gauge Bench Mark
.....

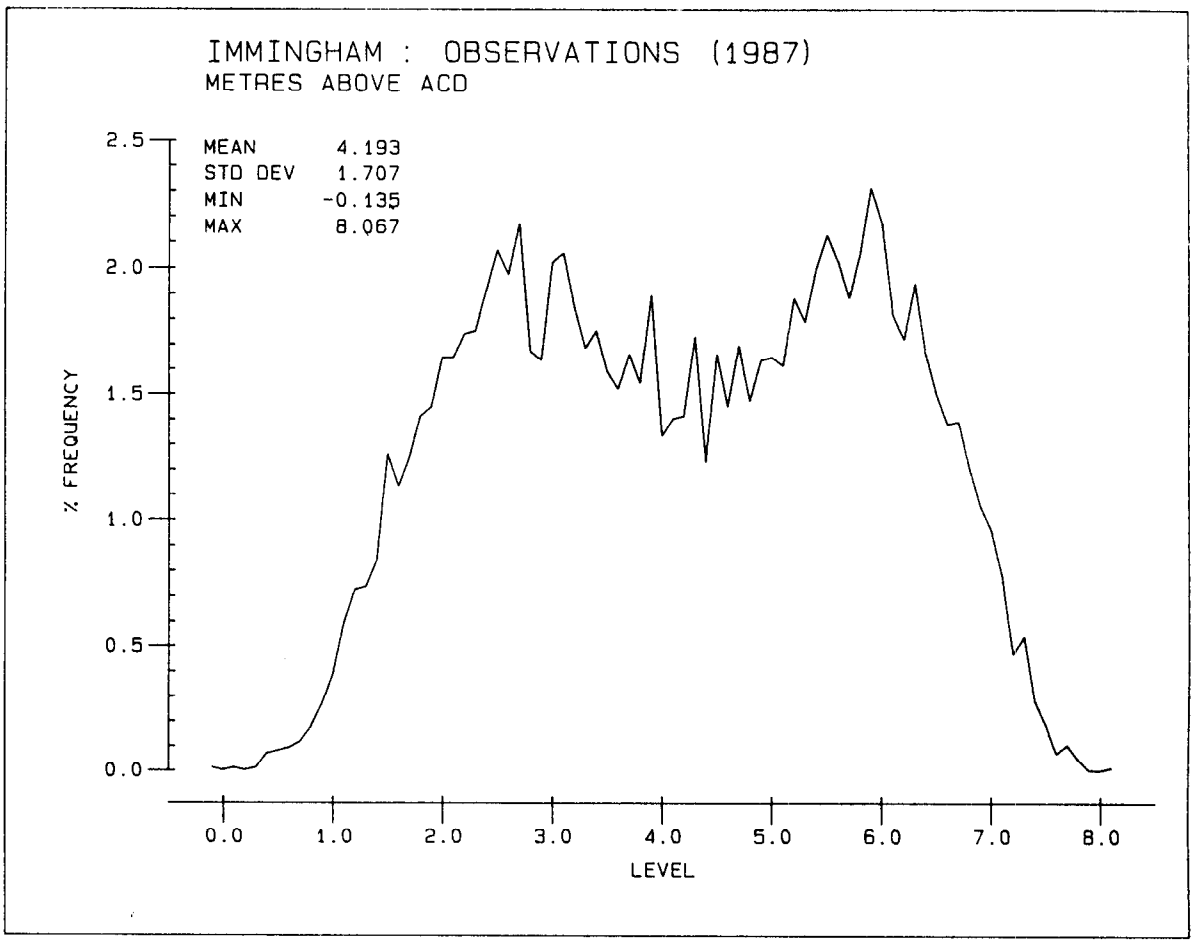
Flush Bracket G4658 on office building, N.angle, NE face
National Grid reference TA 1989 1630

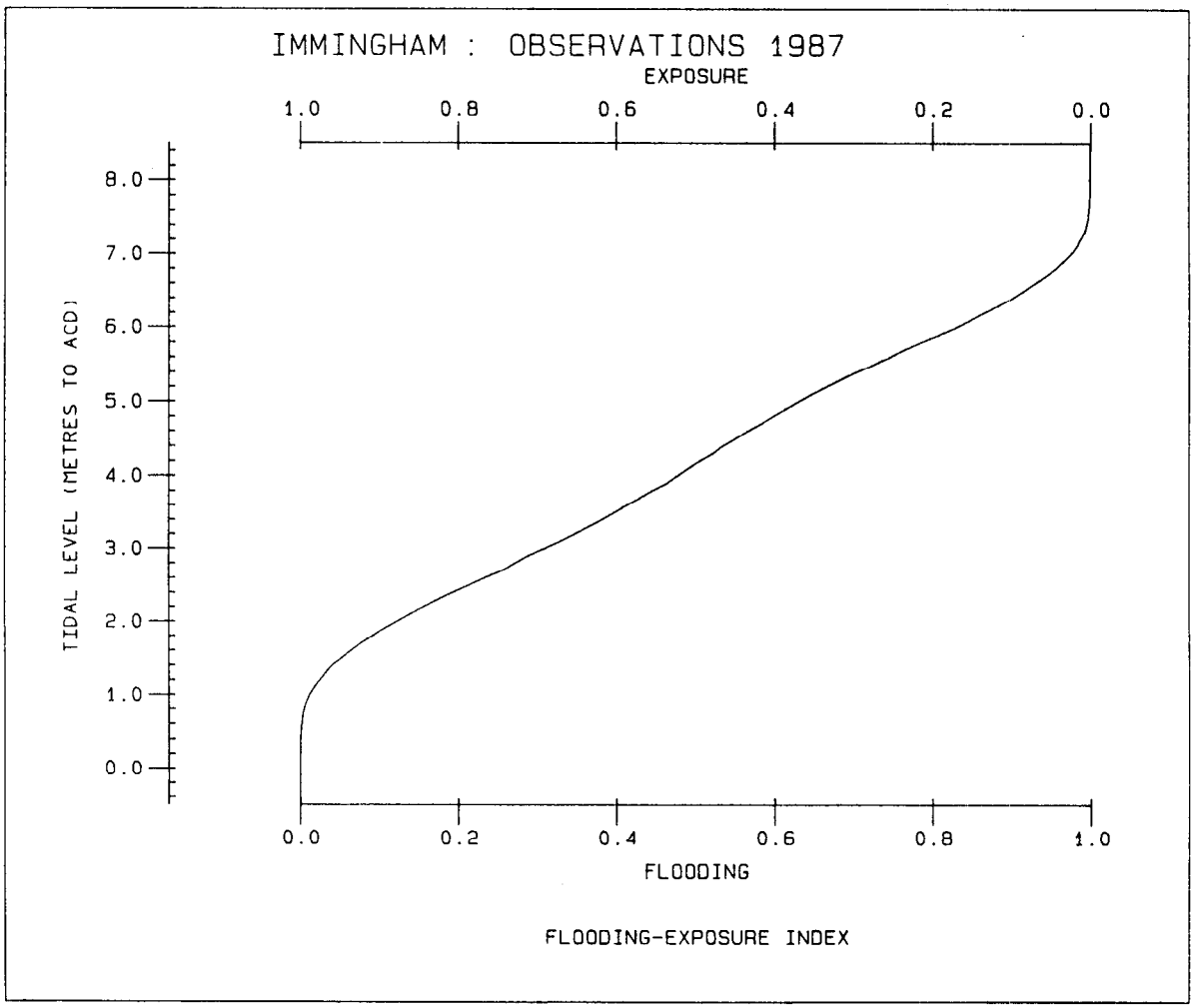
Filtered hourly levels
.....

Gaps 2000gmt 10 Mar. to 0300gmt 19 Mar.....rubbish data removed

Site diary
.....

17-19 March TGI visit to carry out calibration checks on Dataring sensors
TGI comment: Owing to the variation in sea water density noted at different states of the tide it is impossible to obtain accurate data from the pneumatic system, since the scaling is based on a fixed value for water density.
14-15 October TGI visit. DQ recalibrated and datum raised 28mm
11 November TGI visit. DQ recalibrated with new density values. Large variation in density values at this site (fresh water)
Densities have been seen to vary from 1.011 to 1.020 kgm^{-3} over a single tide.


IMMINGHAM : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 4.193
STD DEV 1.707
MIN -0.135
MAX 8.067
% FREQUENCY
2.5
2.0
1.5
1.0
0.5
0.0
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0
LEVEL


IMMINGHAM : OBSERVATIONS 1987
EXPOSURE
1.0 0.8 0.6 0.4 0.2 0.0
TIDAL LEVEL (METRES TO ACD)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0 0.2 0.4 0.6 0.8 1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, EAST COAST - IMMINGHAM

LATITUDE: 53 37' 58.6" N

LONGITUDE: 0 11' 13.0" E

TIME ZONE: GMT

LENGTH: 357 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 4.193

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 3.90 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.4194D+01 RESIDUAL MEAN = 0.2055D-06
STD = 0.1709D+01 STD = 0.1562D+00

	H	G		H	G		H	G		H	G
SA	0.095	188.63	2Q1	0.014	34.72	OQ2	0.017	57.60	MO3	0.031	233.65
SSA	0.017	95.39	SIGMA1	0.001	189.25	MNS2	0.028	203.78	M3	0.030	201.00
MM	0.014	238.44	Q1	0.065	58.55	2N2	0.097	126.85	SO3	0.013	285.24
MSF	0.012	348.34	RHO1	0.016	102.21	MU2	0.085	221.29	MK3	0.037	28.08
MF	0.020	191.66	O1	0.174	113.34	N2	0.433	140.02	SK3	0.016	88.02
			MP1	0.010	339.57	NU2	0.101	132.30			
			M1	0.004	276.72	OP2	0.012	130.09	MN4	0.010	196.89
			CHI1	0.005	289.04	M2	2.278	161.79	M4	0.015	191.05
			PI1	0.008	164.65	MKS2	0.018	280.81	SN4	0.010	249.07
			P1	0.048	263.38	LAMDA2	0.060	156.19	MS4	0.031	248.71
			S1	0.008	192.26	*L2	0.122	172.09	MK4	0.009	244.70
			K1	0.153	283.57	T2	0.036	196.17	S4	0.010	327.73
			PSI1	0.007	141.59	S2	0.757	211.80	SK4	0.006	323.32
			PHI1	0.008	311.38	R2	0.006	312.11			
			THETA1	0.003	320.34	K2	0.217	209.57	2MN6	0.008	126.74
			J1	0.012	34.68	MSN2	0.037	10.11	M6	0.016	149.80
			SO1	0.004	77.91	KJ2	0.011	93.38	MSN6	0.008	183.90
			OO1	0.007	58.66	2SM2	0.041	38.85	2MS6	0.027	188.45
									2MK6	0.008	193.50
									2SM6	0.009	251.71
									MSK6	0.006	252.88

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, EAST COAST - IMMINGHAM
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.008	354.82
3M(SK)2	26.87018	0.013	28.27
3M2S2	26.95231	0.017	43.21
SNK2	28.35759	0.003	6.65
2SK2	29.91786	0.005	83.30
MQ3	42.38277	0.010	182.50
2MP3	43.00928	0.008	201.22
2MQ3	44.56955	0.006	164.33
3MK4	56.87018	0.004	200.22
3MS4	56.95231	0.021	188.41
2MSK4	57.88607	0.003	245.56
3MK5	71.91124	0.011	143.20
M5	72.46026	0.006	123.70
3MO5	73.00928	0.013	314.93
2(MN)S6	84.84767	0.002	98.49
3MNS6	85.39204	0.001	23.79
4MK6	85.85428	0.002	271.61
4MS6	85.93642	0.003	132.71
2MSNK6	86.32580	0.001	297.80
2MV6	86.48079	0.002	20.30
3MSK6	86.87018	0.002	308.22
4MN6	87.49669	0.006	315.64
3MSN6	88.51258	0.008	20.06
MKL6	88.59472	0.001	188.79
2(MN)8	114.84767	0.004	116.35
3MN8	115.39204	0.009	136.40
M8	115.93642	0.011	164.42
2MSN8	116.40794	0.008	201.57
3MS8	116.95231	0.017	222.04
3MK8	117.03445	0.005	224.66
MSNK8	117.50597	0.004	280.55
2(MS)8	117.96821	0.007	285.11
2MSK8	118.05035	0.004	284.47
4MS10	145.93642	0.004	183.45
3M2S10	146.95231	0.003	247.74
MVS2	27.49669	0.013	218.79
MA2	28.94304	0.029	103.30
MB2	29.02517	0.014	0.11
MSV2	30.47152	0.009	149.95
SKM2	31.09803	0.020	29.70
2MNS4	56.40794	0.007	146.01
MV4	57.49669	0.006	18.29
3MN4	58.51258	0.007	297.76
2MSN4	59.52848	0.004	173.91
NA2	28.39866	0.006	31.72
NB2	28.48080	0.009	91.23
MSO5	72.92714	0.007	314.65
MSK5	74.02517	0.007	286.71

2.11 LOWESTOFT Primary Pot Channel 2 (Munro gauge well)
Secondary Pot Channel 1 (Ott gauge well)

TGZ = ACD = 1.5m below ODN
TGZ = 4.48m below TGBM

Details of Tide Gauge Bench Mark
.....

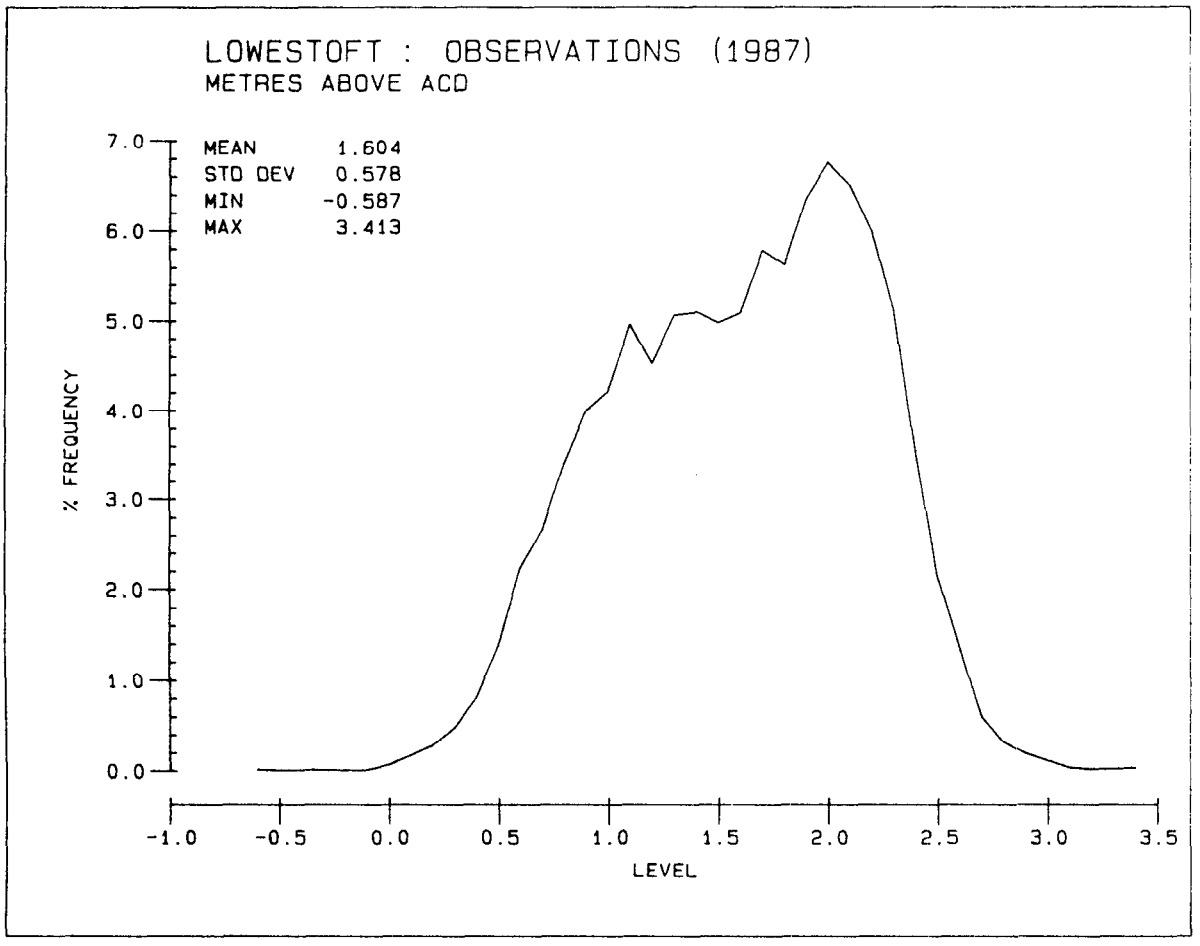
OSBM Bolt in quay wall on south side of pier
National Grid reference TM 5482 9273

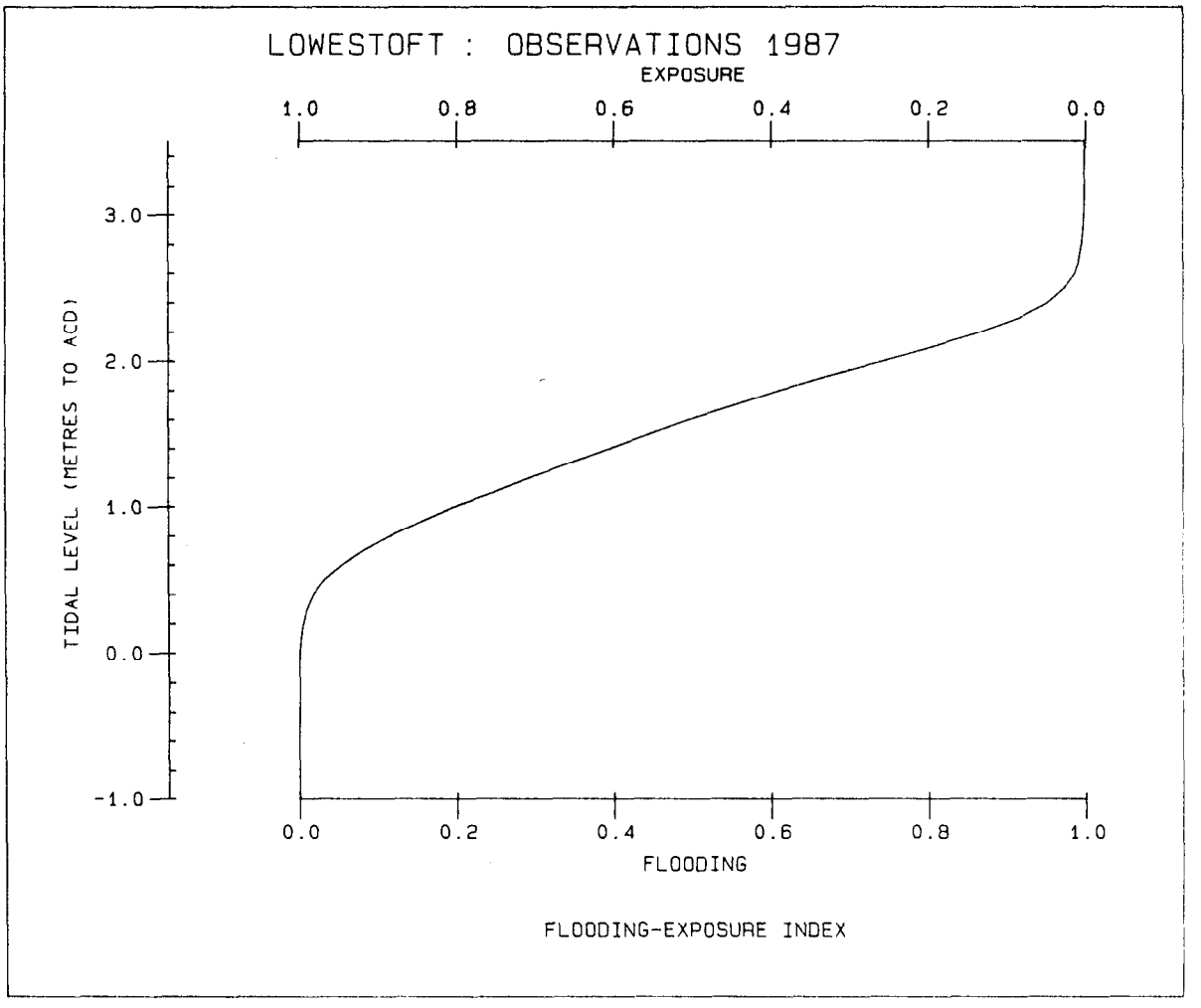
Filtered hourly heights
.....

Nil gaps

Site Diary
.....

24 February TGI visit to fit replacement clock on Munro gauge.
28 october TGI visit for routine servicing.


LOWESTOFT : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 1.604
STD DEV 0.578
MIN -0.587
MAX 3.413
% FREQUENCY
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
LEVEL


LOWESTOFT : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
3.0
2.0
1.0
0.0
-1.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, EAST COAST - LOWESTOFT

LATITUDE: 52 28' 19.9" N

LONGITUDE: 1 45' 06.3" E

TIME ZONE: GMT

LENGTH: 365 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 1.606

HOURLY DATA FROM POTENTIOMETER GAUGE 2

DATUM OF OBSERVATIONS = ACD : 1.50 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.1605D+01 RESIDUAL MEAN = 0.3304D-06
STD = 0.5762D+00 STD = 0.1776D+00

	H	G		H	G		H	G		H	G
SA	0.092	189.74	2Q1	0.013	80.96	OQ2	0.004	182.50	MO3	0.011	4.84
SSA	0.021	134.95	SIGMA1	0.004	311.11	MNS2	0.007	350.49	M3	0.008	319.23
MM	0.034	278.60	Q1	0.051	101.38	2N2	0.026	241.97	SO3	0.004	53.20
MSF	0.011	52.08	RHO1	0.015	141.71	MU2	0.027	98.62	MK3	0.012	177.67
MF	0.013	179.11	O1	0.141	158.32	N2	0.140	228.50	SK3	0.005	221.08
			MP1	0.010	13.61	NU2	0.035	253.11			
			M1	0.004	2.77	OP2	0.004	318.28	MN4	0.017	322.13
			CHI1	0.002	292.14	M2	0.699	260.11	M4	0.048	331.52
			PI1	0.004	192.62	MKS2	0.002	338.44	SN4	0.005	41.74
			P1	0.044	318.24	LAMDA2	0.011	296.33	MS4	0.041	23.83
			S1	0.005	267.56	*L2	0.036	302.03	MK4	0.012	19.70
			K1	0.120	333.75	T2	0.008	283.45	S4	0.004	104.88
			PSI1	0.003	179.81	S2	0.212	298.33	SK4	0.003	99.32
			PHI1	0.006	335.03	R2	0.002	4.05			
			THETA1	0.004	356.23	K2	0.060	296.74	2MN6	0.023	89.33
			J1	0.010	95.66	MSN2	0.005	128.75	M6	0.037	117.90
			SO1	0.005	126.54	KJ2	0.004	143.41	MSN6	0.011	133.18
			OO1	0.005	109.42	2SM2	0.006	138.81	2MS6	0.041	163.32
									2MK6	0.010	164.01
									2SM6	0.010	211.58
									MSK6	0.006	212.96

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, EAST COAST - LOWESTOFT
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.004	134.11
3M(SK)2	26.87018	0.008	199.43
3M2S2	26.95231	0.016	220.10
SNK2	28.35759	0.001	125.45
2SK2	29.91786	0.001	139.08
MQ3	42.38277	0.004	301.21
2MP3	43.00928	0.005	18.02
2MQ3	44.56955	0.003	300.22
3MK4	56.87018	0.003	66.88
3MS4	56.95231	0.005	20.85
2MSK4	57.88607	0.001	124.21
3MK5	71.91124	0.012	23.86
M5	72.46026	0.007	351.44
3MO5	73.00928	0.013	188.16
2(MN)S6	84.84767	0.001	263.07
3MNS6	85.39204	0.003	215.09
4MK6	85.85428	0.006	217.67
4MS6	85.93642	0.002	315.51
2MSNK6	86.32580	0.002	269.72
2MV6	86.48079	0.004	101.84
3MSK6	86.87018	0.003	306.66
4MN6	87.49669	0.008	304.15
3MSN6	88.51258	0.008	11.46
MKL6	88.59472	0.001	219.78
2(MN)8	114.84767	0.002	258.50
3MN8	115.39204	0.005	266.14
M8	115.93642	0.007	295.31
2MSN8	116.40794	0.005	321.68
3MS8	116.95231	0.012	339.84
3MK8	117.03445	0.003	339.26
MSNK8	117.50597	0.003	39.89
2(MS)8	117.96821	0.005	39.61
2MSK8	118.05035	0.003	47.04
4MS10	145.93642	0.003	60.23
3M2S10	146.95231	0.002	103.09
MVS2	27.49669	0.007	29.83
MA2	28.94304	0.004	240.07
MB2	29.02517	0.011	58.82
MSV2	30.47152	0.001	194.12
SKM2	31.09803	0.002	105.36
2MNS4	56.40794	0.002	22.07
MV4	57.49669	0.004	288.08
3MN4	58.51258	0.008	143.95
2MSN4	59.52848	0.005	21.87
NA2	28.39866	0.002	95.24
NB2	28.48080	0.001	116.87
MSO5	72.92714	0.008	184.78
MSK5	74.02517	0.007	147.13

2.12 SHEERNESS Primary DQ Channel 2
Secondary DQ Channel 1

TGZ = ACD = 2.9m below ODN
TGZ = 7.532m below TGBM

Details of Tide Gauge Bench Mark
.....

Flush bracket 11859 Garrison Point Fort S.angle, 0.6m SW of building
National Grid reference TQ 9080 7549

Filtered hourly levels
.....

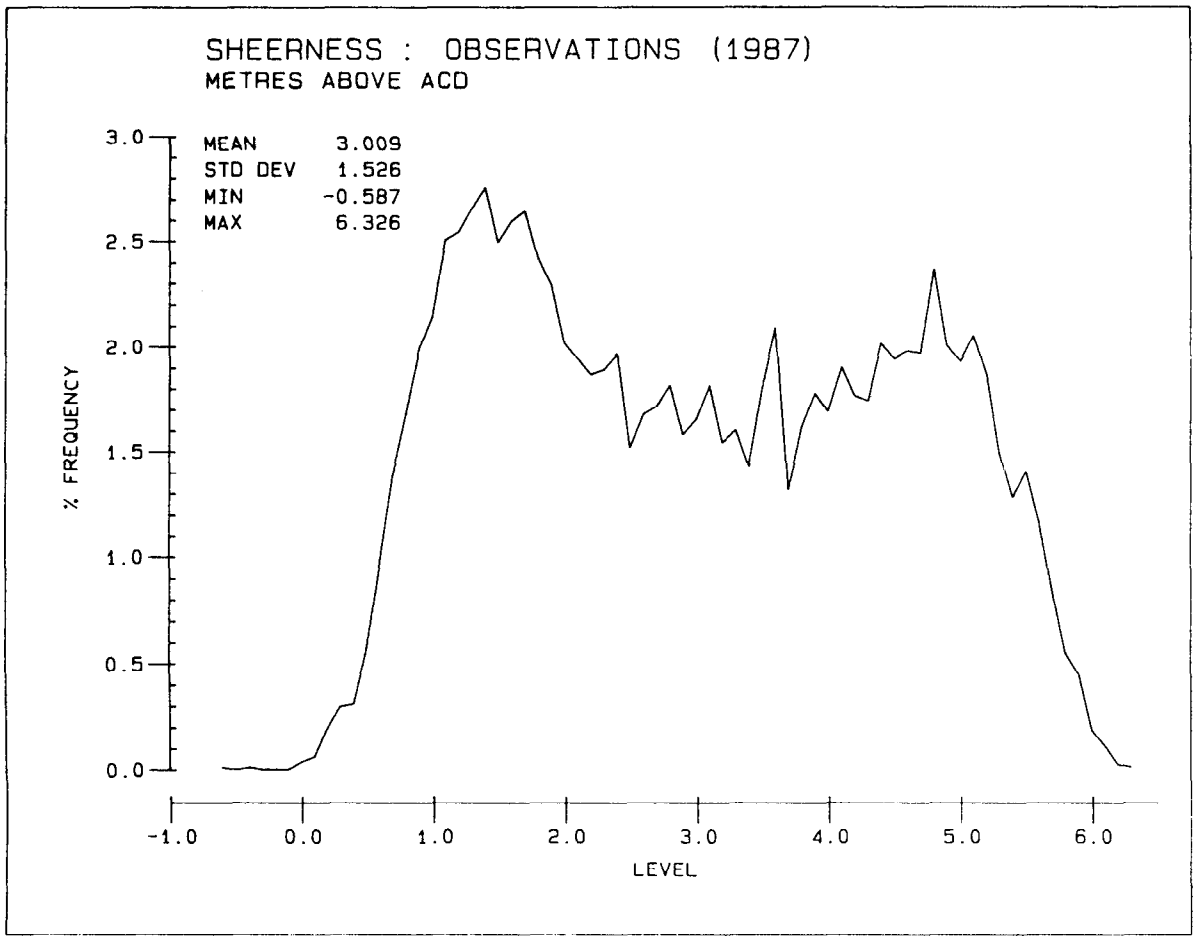
Gaps 0500gmt 16 Oct. to 1800 17 Nov.....pressure points
washed away in severe storm

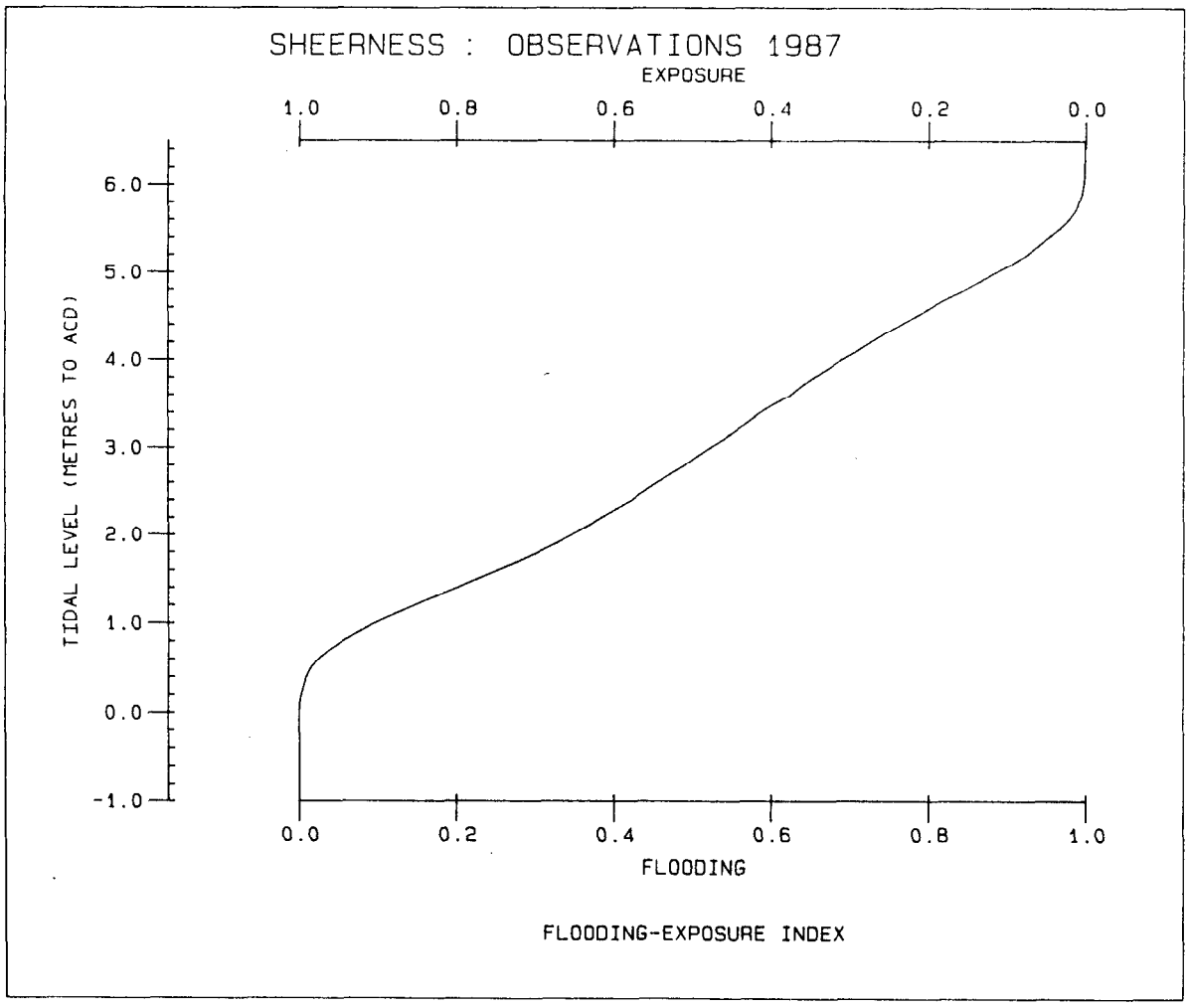
The fender piles carrying the pressure points had been smashed during the storm by battering from a vessel tied alongside. All units were recovered.

Site diary
.....

27 January TGI visit for routine maintenance. A new improved clock card was fitted to the Dataring unit.

16-17 November TGI visit.
New pressure points were fitted during the visit, this time to a cylindrical steel pile beneath the tide gauge house under the centre of the jetty and away from the edge.


SHEERNESS : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 3.009
STD DEV 1.526
MIN -0.587
MAX 6.326
% FREQUENCY
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
LEVEL


SHEERNESS : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, EAST COAST - SHEERNESS

LATITUDE: 51 26' 44.0" N

LONGITUDE: 0 44' 42.5" E

TIME ZONE: GMT

LENGTH: 364 DAYS

FROM: 1ST DECEMBER, 1986 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 3.013

HOURLY DATA FROM DIGIQUARTZ GAUGE

DATUM OF OBSERVATIONS = ACD : 2.90 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.3009D+01 RESIDUAL MEAN = 0.1392D-05
STD = 0.1527D+01 STD = 0.2102D+00

	H	G		H	G		H	G		H	G
SA	0.085	193.98	2Q1	0.016	121.23	OQ2	0.018	257.22	MO3	0.049	120.55
SSA	0.019	129.01	SIGMA1	0.003	182.98	MNS2	0.030	47.56	M3	0.034	100.92
MM	0.039	273.92	Q1	0.047	129.07	2N2	0.096	316.79	SO3	0.018	195.91
MSF	0.040	51.49	RHO1	0.013	191.21	MU2	0.130	91.24	MK3	0.042	304.17
MF	0.018	165.49	O1	0.136	185.22	N2	0.343	328.13	SK3	0.014	0.59
			MP1	0.009	59.56	NU2	0.111	322.53			
			M1	0.008	11.59	OP2	0.022	353.96	MN4	0.032	327.34
			CHI1	0.005	323.51	M2	2.040	353.53	M4	0.127	10.10
			PI1	0.006	199.08	MKS2	0.007	117.32	SN4	0.016	274.84
			P1	0.046	354.64	LAMDA2	0.064	8.77	MS4	0.046	83.06
			S1	0.002	76.83	*L2	0.148	21.32	MK4	0.015	71.85
			K1	0.118	13.92	T2	0.028	35.54	S4	0.003	359.68
			PSI1	0.006	273.03	S2	0.593	50.09	SK4	0.001	332.21
			PHI1	0.007	33.45	R2	0.007	134.72			
			THETA1	0.003	4.24	K2	0.172	48.29	2MN6	0.029	9.91
			J1	0.017	132.49	MSN2	0.042	229.15	M6	0.051	33.25
			SO1	0.009	147.07	KJ2	0.003	344.14	MSN6	0.011	80.02
			OO1	0.003	133.08	2SM2	0.044	260.82	2MS6	0.054	87.11
									2MK6	0.014	87.99
									2SM6	0.011	154.59
									MSK6	0.006	151.71

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, EAST COAST - SHEERNESS
SPAN OF DATA FROM 1ST DECEMBER, 1986 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.005	167.03
3M(SK)2	26.87018	0.025	217.73
3M2S2	26.95231	0.043	231.05
SNK2	28.35759	0.005	242.53
2SK2	29.91786	0.006	331.44
MQ3	42.38277	0.022	65.19
2MP3	43.00928	0.008	118.01
2MQ3	44.56955	0.008	89.58
3MK4	56.87018	0.013	108.77
3MS4	56.95231	0.033	128.22
2MSK4	57.88607	0.008	221.35
3MK5	71.91124	0.006	29.44
M5	72.46026	0.004	323.29
3MO5	73.00928	0.008	168.84
2(MN)S6	84.84767	0.004	79.25
3MNS6	85.39204	0.006	81.94
4MK6	85.85428	0.009	133.83
4MS6	85.93642	0.009	118.15
2MSNK6	86.32580	0.002	172.84
2MV6	86.48079	0.010	342.04
3MSK6	86.87018	0.006	194.35
4MN6	87.49669	0.014	215.78
3MSN6	88.51258	0.014	281.97
MKL6	88.59472	0.002	118.64
2(MN)8	114.84767	0.005	269.53
3MN8	115.39204	0.009	287.61
M8	115.93642	0.011	317.85
2MSN8	116.40794	0.007	327.37
3MS8	116.95231	0.017	2.48
3MK8	117.03445	0.005	8.29
MSNK8	117.50597	0.004	60.71
2(MS)8	117.96821	0.007	54.78
2MSK8	118.05035	0.004	53.53
4MS10	145.93642	0.002	116.29
3M2S10	146.95231	0.002	183.55
MVS2	27.49669	0.033	56.23
MA2	28.94304	0.038	327.22
MB2	29.02517	0.021	151.66
MSV2	30.47152	0.006	30.94
SKM2	31.09803	0.022	257.15
2MNS4	56.40794	0.007	50.45
MV4	57.49669	0.024	323.12
3MN4	58.51258	0.015	228.36
2MSN4	59.52848	0.007	117.73
NA2	28.39866	0.006	202.10
NB2	28.48080	0.006	281.58
MSO5	72.92714	0.003	205.22
MSK5	74.02517	0.005	127.62

2.13 DOVER Primary Pot. Channel 2 (Munro gauge well)
Secondary Pot. Channel 1 (Ott gauge well)

TGZ = ACD = 3.67m below ODN
TGZ = 10.491m below TGBM

Details of Tide Gauge Bench Mark
.....

Flush bracket G4868 on building at the E side of entrance to works.
National Grid reference TR 3193 4074

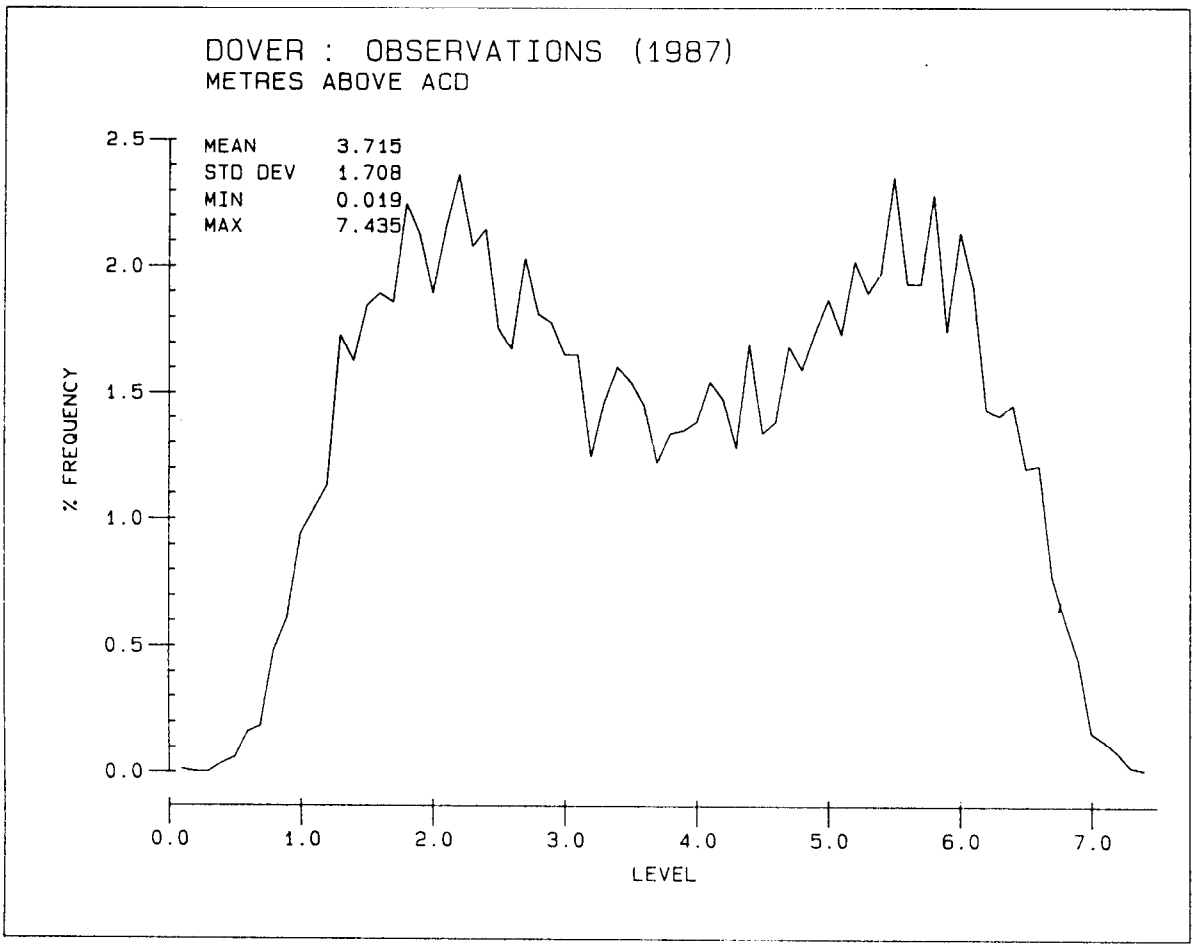
Filtered hourly levels
.....

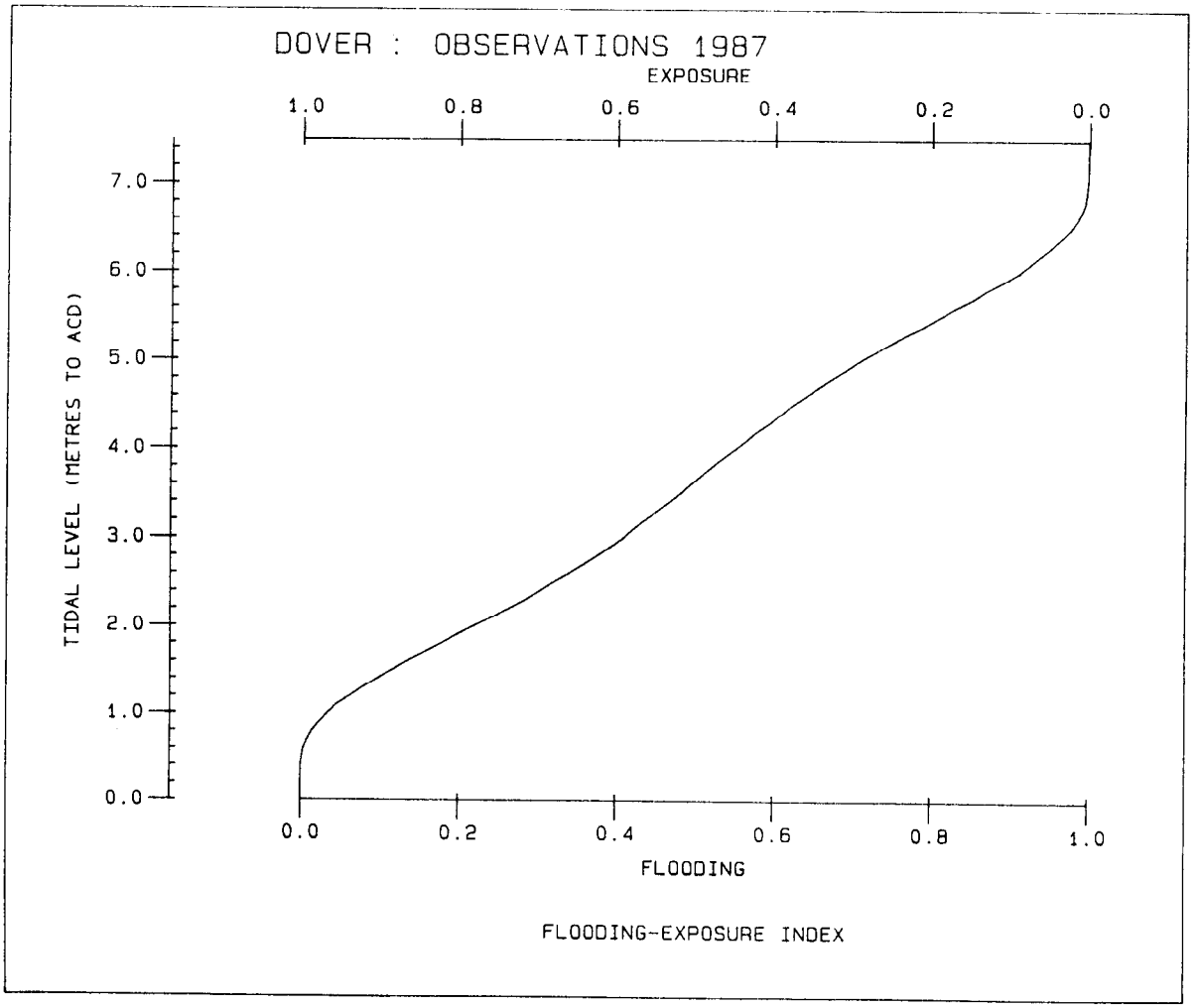
Gaps 1500gmt 04 Jan. to 0400gmt 05 Jan.....memory loss at site
0700gmt 28 Jan. to 2100gmt 29 Jan.....gauge jammed
0300gmt 15 Sep. to 1300gmt 16 Sep.....gauge clock error

Site diary
.....

28 January TGI visit to repair well-head unit which had failed through breakage of the float-wire. The potentiometer (channel 1) was damaged. A new clock card with improved clock source was fitted. The following day the clock card had stopped operating and a return visit was made to rectify the fault.

18 November TGI visit for routine testing.
Calibration of well-head unit checked (Channel 1) to determine the quality of new float wire. No stretching of the wire had taken place.


DOVER : OBSERVATIONS (1987)
METRES ABOVE ACD
MEAN 3.715
STD DEV 1.708
MIN 0.019
MAX 7.435
% FREQUENCY
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
LEVEL


DOVER : OBSERVATIONS 1987
EXPOSURE
1.0
0.8
0.6
0.4
0.2
0.0
TIDAL LEVEL (METRES TO ACD)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.2
0.4
0.6
0.8
1.0
FLOODING
FLOODING-EXPOSURE INDEX

PROUDMAN OCEANOGRAPHIC LABORATORY (BIDSTON OBSERVATORY)

HARMONIC TIDAL ANALYSIS.

PORT: ENGLAND, SOUTH COAST - DOVER

LATITUDE: 51 07' 01.0" N

LONGITUDE: 1 19' 05.4" E

TIME ZONE: GMT

LENGTH: 362 DAYS

FROM: 1ST JANUARY, 1987 TO: 31ST DECEMBER, 1987

UNITS: METRES A0: 3.717

HOURLY DATA FROM POTENTIOMETER GAUGE 2

DATUM OF OBSERVATIONS = ACD : 3.67 METRES BELOW ORDNANCE DATUM (NEWLYN)

OBSERVATION MEAN = 0.3717D+01 RESIDUAL MEAN = 0.3722D-06
STD = 0.1710D+01 STD = 0.1528D+00

	H	G		H	G		H	G		H	G
SA	0.089	186.34	2Q1	0.007	93.33	OQ2	0.016	228.96	MO3	0.003	174.48
SSA	0.025	97.60	SIGMA1	0.007	345.82	MNS2	0.027	21.43	M3	0.007	69.78
MM	0.022	254.82	Q1	0.028	109.55	2N2	0.095	299.20	SO3	0.003	17.68
MSF	0.004	167.86	RHO1	0.010	185.93	MU2	0.089	47.85	MK3	0.018	13.69
MF	0.011	192.91	O1	0.062	176.17	N2	0.415	309.30	SK3	0.007	80.33
			MP1	0.004	99.25	NU2	0.105	299.94			
			M1	0.003	191.70	OP2	0.017	317.66	MN4	0.097	198.11
			CHI1	0.002	302.79	M2	2.280	331.63	M4	0.270	220.22
			PI1	0.006	234.70	MKS2	0.014	103.24	SN4	0.009	295.32
			P1	0.021	23.63	LAMDA2	0.069	336.55	MS4	0.177	273.40
			S1	0.002	235.89	*L2	0.130	345.07	MK4	0.051	269.19
			K1	0.055	42.57	T2	0.041	15.03	S4	0.018	351.69
			PSI1	0.004	282.84	S2	0.725	23.20	SK4	0.011	352.55
			PHI1	0.006	7.45	R2	0.006	58.62			
			THETA1	0.007	5.01	K2	0.210	21.23	2MN6	0.036	79.64
			J1	0.009	178.76	MSN2	0.044	193.82	M6	0.067	104.79
			SO1	0.006	230.43	KJ2	0.010	283.00	MSN6	0.012	141.72
			OO1	0.004	190.07	2SM2	0.047	222.19	2MS6	0.068	149.55
									2MK6	0.019	149.52
									2SM6	0.016	211.15
									MSK6	0.009	212.25

* L2 computed using u=0.0, f=1.0

ADDITIONAL CONSTITUENTS FOR ENGLAND, SOUTH COAST - DOVER
SPAN OF DATA FROM 1ST JANUARY, 1987 TO 31ST DECEMBER, 1987

	SIGMA	H	G
2MN2S2	26.40794	0.007	145.16
3M(SK)2	26.87018	0.017	192.88
3M2S2	26.95231	0.022	203.00
SNK2	28.35759	0.005	197.83
2SK2	29.91786	0.004	258.65
MQ3	42.38277	0.002	317.43
2MP3	43.00928	0.005	134.38
2MQ3	44.56955	0.005	95.39
3MK4	56.87018	0.023	318.75
3MS4	56.95231	0.029	294.52
2MSK4	57.88607	0.009	39.78
3MK5	71.91124	0.012	196.47
M5	72.46026	0.004	168.15
3MO5	73.00928	0.009	344.77
2(MN)S6	84.84767	0.005	189.63
3MNS6	85.39204	0.007	162.51
4MK6	85.85428	0.012	203.75
4MS6	85.93642	0.011	195.88
2MSNK6	86.32580	0.002	249.58
2MV6	86.48079	0.014	54.55
3MSK6	86.87018	0.006	271.94
4MN6	87.49669	0.017	277.63
3MSN6	88.51258	0.015	344.86
MKL6	88.59472	0.002	154.76
2(MN)8	114.84767	0.007	327.43
3MN8	115.39204	0.013	345.87
M8	115.93642	0.017	14.27
2MSN8	116.40794	0.009	39.01
3MS8	116.95231	0.025	58.94
3MK8	117.03445	0.007	56.99
MSNK8	117.50597	0.005	119.23
2(MS)8	117.96821	0.010	116.07
2MSK8	118.05035	0.006	116.84
4MS10	145.93642	0.003	351.63
3M2S10	146.95231	0.002	42.75
MVS2	27.49669	0.015	18.93
MA2	28.94304	0.015	290.10
MB2	29.02517	0.010	73.20
MSV2	30.47152	0.005	323.45
SKM2	31.09803	0.024	212.93
2MNS4	56.40794	0.012	269.61
MV4	57.49669	0.028	171.40
3MN4	58.51258	0.034	47.20
2MSN4	59.52848	0.020	285.37
NA2	28.39866	0.003	141.63
NB2	28.48080	0.005	284.16
MSO5	72.92714	0.009	355.06
MSK5	74.02517	0.006	290.00

ACKNOWLEDGEMENTS

My thanks to everyone involved with their help and assistance in the preparation of this report. In particular I would like to thank Phil Knight, Elizabeth Macleod, Rose Maher and Joyce Richards who collected and processed the data in the first place and David Blackman for the analyses and the loan of some of his computer programs.

3. ANALYSED DATA STATISTICS

3.1 Extreme level values

NEWLYN

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.425	2	13	5.918	31	6
FEBRUARY	0.466	28	12	5.875	1	7
MARCH	0.274	2	13	5.811	1	6
APRIL	0.525	15	12	5.572	1	6
MAY	0.703	15	0	5.526	14	17
JUNE	0.780	13	0	5.498	14	19
JULY	0.660	13	0	5.749	14	19
AUGUST	0.472	12	1	5.937	11	18
SEPTEMBER	0.415	9	0	5.979	9	18
OCTOBER	0.611	8	12	6.214	7	17
NOVEMBER	0.746	5	23	5.499	5	16
DECEMBER	0.746	22	12	5.679	23	6
ANNUAL	0.274	2	13	6.214	7	17

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-2.625	2	13	2.868	31	6
FEBRUARY	-2.584	28	12	2.825	1	7
MARCH	-2.776	2	13	2.761	1	6
APRIL	-2.525	15	12	2.522	1	6
MAY	-2.347	15	0	2.476	14	17
JUNE	-2.270	13	0	2.448	14	19
JULY	-2.390	13	0	2.699	14	19
AUGUST	-2.578	12	1	2.887	11	18
SEPTEMBER	-2.635	9	0	2.929	9	18
OCTOBER	-2.439	8	12	3.164	7	17
NOVEMBER	-2.304	5	23	2.449	5	16
DECEMBER	-2.304	22	12	2.629	23	6
ANNUAL	-2.776	2	13	3.164	7	17

ILFRACOMBE

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	0.507	31	13	9.750	31	7
FEBRUARY	0.510	28	12	9.798	1	8
MARCH	0.327	29	12	9.977	1	7
APRIL	0.509	16	1	9.309	1	8
MAY	0.813	15	1	9.306	14	6
JUNE	0.929	14	1	9.224	13	19
JULY	0.714	14	2	9.487	13	20
AUGUST	0.436	11	1	9.720	10	19
SEPTEMBER	0.351	9	1	10.060	9	19
OCTOBER	0.793	9	1	10.230	7	18
NOVEMBER	0.883	4	23	9.165	5	18
DECEMBER	0.904	22	13	9.184	23	8
ANNUAL	0.327	29	12	10.230	7	18

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	-4.293	31	13	4.950	31	7
FEBRUARY	-4.290	28	12	4.998	1	8
MARCH	-4.473	29	12	5.177	1	7
APRIL	-4.291	16	1	4.509	1	8
MAY	-3.987	15	1	4.506	14	6
JUNE	-3.871	14	1	4.424	13	19
JULY	-4.086	14	2	4.687	13	20
AUGUST	-4.364	11	1	4.920	10	19
SEPTEMBER	-4.449	9	1	5.260	9	19
OCTOBER	-4.007	9	1	5.430	7	18
NOVEMBER	-3.917	4	23	4.365	5	18
DECEMBER	-3.896	22	13	4.384	23	8
ANNUAL	-4.473	29	12	5.430	7	18

AVONMOUTH

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	0.699	31	3	13.830	1	8
FEBRUARY	0.677	1	4	13.860	1	9
MARCH	0.462	31	3	14.080	1	8
APRIL	0.577	16	3	13.460	1	9
MAY	0.824	15	3	13.340	14	20
JUNE	1.099	14	3	13.070	13	20
JULY	1.162	15	5	13.400	14	22
AUGUST	0.645	12	4	13.970	11	21
SEPTEMBER	0.518	9	3	14.120	8	20
OCTOBER	1.077	23	14	14.330	7	19
NOVEMBER	0.946	6	2	13.190	22	20
DECEMBER	0.999	22	15	13.170	23	9
ANNUAL	0.462	31	3	14.330	7	19

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	-5.801	31	3	7.330	1	8
FEBRUARY	-5.823	1	4	7.360	1	9
MARCH	-6.038	31	3	7.580	1	8
APRIL	-5.923	16	3	6.960	1	9
MAY	-5.676	15	3	6.840	14	20
JUNE	-5.401	14	3	6.570	13	20
JULY	-5.338	15	5	6.900	14	22
AUGUST	-5.855	12	4	7.470	11	21
SEPTEMBER	-5.982	9	3	7.620	8	20
OCTOBER	-5.423	23	14	7.830	7	19
NOVEMBER	-5.554	6	2	6.690	22	20
DECEMBER	-5.501	22	15	6.670	23	9
ANNUAL	-6.038	31	3	7.830	7	19

HOLYHEAD

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	0.061	2	18	6.018	31	11
FEBRUARY	0.187	28	17	6.107	1	12
MARCH	0.155	2	18	6.127	1	11
APRIL	0.344	15	17	5.608	1	12
MAY	0.462	15	5	5.583	14	10
JUNE	1.168	18	10	5.239	27	23
JULY	0.443	13	6	5.950	15	1
AUGUST	0.285	12	6	6.122	12	0
SEPTEMBER	0.245	9	5	6.229	9	23
OCTOBER	0.619	7	4	6.485	7	22
NOVEMBER	0.572	23	17	5.644	5	22
DECEMBER	0.621	22	17	5.915	24	13
ANNUAL	0.061	2	18	6.485	7	22

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	-2.989	2	18	2.968	31	11
FEBRUARY	-2.863	28	17	3.057	1	12
MARCH	-2.895	2	18	3.077	1	11
APRIL	-2.706	15	17	2.558	1	12
MAY	-2.588	15	5	2.533	14	10
JUNE	-1.882	18	10	2.189	27	23
JULY	-2.607	13	6	2.900	15	1
AUGUST	-2.765	12	6	3.072	12	0
SEPTEMBER	-2.805	9	5	3.179	9	23
OCTOBER	-2.431	7	4	3.435	7	22
NOVEMBER	-2.478	23	17	2.594	5	22
DECEMBER	-2.429	22	17	2.865	24	13
ANNUAL	-2.989	2	18	3.435	7	22

MILLPORT

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-0.086	2	19	3.881	4	15
FEBRUARY	0.008	28	18	3.854	2	15
MARCH	-0.036	29	18	3.894	27	11
APRIL	0.226	16	7	3.624	19	16
MAY	0.101	22	14	3.569	2	3
JUNE	0.111	16	9	3.478	28	1
JULY	0.072	13	7	3.689	15	3
AUGUST	-0.012	10	6	3.839	13	3
SEPTEMBER	0.128	8	6	4.102	12	3
OCTOBER	0.396	24	6	3.981	8	0
NOVEMBER	-0.110	23	19	3.927	11	15
DECEMBER	0.197	2	3	3.849	24	15
ANNUAL	-0.110	23	19	4.102	12	3

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-1.706	2	19	2.261	4	15
FEBRUARY	-1.612	28	18	2.234	2	15
MARCH	-1.656	29	18	2.274	27	11
APRIL	-1.394	16	7	2.004	19	16
MAY	-1.519	22	14	1.949	2	3
JUNE	-1.509	16	9	1.858	28	1
JULY	-1.548	13	7	2.069	15	3
AUGUST	-1.632	10	6	2.219	13	3
SEPTEMBER	-1.492	8	6	2.482	12	3
OCTOBER	-1.224	24	6	2.361	8	0
NOVEMBER	-1.730	23	19	2.307	11	15
DECEMBER	-1.423	2	3	2.229	24	15
ANNUAL	-1.730	23	19	2.482	12	3

STORNOWAY

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.323	2	15	5.273	31	8
FEBRUARY	0.288	28	14	5.253	2	9
MARCH	0.137	2	15	5.290	1	8
APRIL	0.296	15	14	4.759	27	6
MAY	0.486	13	13	4.715	13	19
JUNE	0.683	15	3	4.850	13	20
JULY	0.461	13	2	5.026	13	21
AUGUST	0.246	11	2	5.282	11	20
SEPTEMBER	0.289	9	2	5.557	9	20
OCTOBER	0.601	9	2	5.561	7	19
NOVEMBER	0.567	5	0	4.920	22	7
DECEMBER	0.703	22	14	5.139	24	9
ANNUAL	0.137	2	15	5.561	7	19

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-2.387	2	15	2.563	31	8
FEBRUARY	-2.422	28	14	2.543	2	9
MARCH	-2.573	2	15	2.580	1	8
APRIL	-2.414	15	14	2.049	27	6
MAY	-2.224	13	13	2.005	13	19
JUNE	-2.027	15	3	2.140	13	20
JULY	-2.249	13	2	2.316	13	21
AUGUST	-2.464	11	2	2.572	11	20
SEPTEMBER	-2.421	9	2	2.847	9	20
OCTOBER	-2.109	9	2	2.851	7	19
NOVEMBER	-2.143	5	0	2.210	22	7
DECEMBER	-2.007	22	14	2.429	24	9
ANNUAL	-2.573	2	15	2.851	7	19

WICK

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.132	2	19	3.723	31	12
FEBRUARY	0.068	28	18	3.757	1	13
MARCH	0.107	29	17	3.689	2	13
APRIL	0.320	15	18	3.506	1	13
MAY	0.406	15	6	3.395	14	12
JUNE	0.333	15	8	3.322	14	1
JULY	0.217	13	7	3.612	15	2
AUGUST	0.097	11	6	3.739	14	2
SEPTEMBER	0.213	9	6	4.024	10	0
OCTOBER	0.524	9	6	4.010	7	23
NOVEMBER	0.352	4	4	3.628	19	22
DECEMBER	0.516	2	3	3.869	22	12
ANNUAL	0.068	28	18	4.024	10	0

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-1.578	2	19	2.013	31	12
FEBRUARY	-1.642	28	18	2.047	1	13
MARCH	-1.603	29	17	1.979	2	13
APRIL	-1.390	15	18	1.796	1	13
MAY	-1.304	15	6	1.685	14	12
JUNE	-1.377	15	8	1.612	14	1
JULY	-1.493	13	7	1.902	15	2
AUGUST	-1.613	11	6	2.029	14	2
SEPTEMBER	-1.497	9	6	2.314	10	0
OCTOBER	-1.186	9	6	2.300	7	23
NOVEMBER	-1.358	4	4	1.918	19	22
DECEMBER	-1.194	2	3	2.159	22	12
ANNUAL	-1.642	28	18	2.314	10	0

ABERDEEN

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	0.197	3	22	4.535	31	15
FEBRUARY	0.054	28	20	4.532	1	15
MARCH	-0.006	1	20	4.528	2	15
APRIL	0.401	15	20	4.355	1	15
MAY	0.507	13	19	4.268	14	14
JUNE	0.402	15	10	4.161	13	14
JULY	0.234	13	9	4.389	15	4
AUGUST	0.137	12	9	4.548	12	3
SEPTEMBER	0.172	9	8	4.844	10	2
OCTOBER	0.501	8	8	4.810	8	1
NOVEMBER	0.419	4	6	4.400	22	14
DECEMBER	0.653	23	21	4.710	22	14
ANNUAL	-0.006	1	20	4.844	10	2

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	-2.053	3	22	2.285	31	15
FEBRUARY	-2.196	28	20	2.282	1	15
MARCH	-2.256	1	20	2.278	2	15
APRIL	-1.849	15	20	2.105	1	15
MAY	-1.743	13	19	2.018	14	14
JUNE	-1.848	15	10	1.911	13	14
JULY	-2.016	13	9	2.139	15	4
AUGUST	-2.113	12	9	2.298	12	3
SEPTEMBER	-2.078	9	8	2.594	10	2
OCTOBER	-1.749	8	8	2.560	8	1
NOVEMBER	-1.831	4	6	2.150	22	14
DECEMBER	-1.597	23	21	2.460	22	14
ANNUAL	-2.256	1	20	2.594	10	2

NORTH SHIELDS

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.235	4	0	5.351	31	17
FEBRUARY	0.077	28	22	5.271	1	17
MARCH	-0.259	1	23	5.432	28	15
APRIL	0.382	14	22	5.066	1	17
MAY	0.564	13	22	5.157	14	16
JUNE	0.478	15	12	4.985	13	16
JULY	0.191	14	12	5.180	12	16
AUGUST	0.042	11	11	5.406	12	5
SEPTEMBER	0.108	9	11	5.677	10	5
OCTOBER	0.443	8	10	5.574	8	3
NOVEMBER	0.444	5	9	5.376	20	14
DECEMBER	0.633	22	23	5.494	22	16
ANNUAL	-0.259	1	23	5.677	10	5

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-2.365	4	0	2.751	31	17
FEBRUARY	-2.523	28	22	2.671	1	17
MARCH	-2.859	1	23	2.832	28	15
APRIL	-2.218	14	22	2.466	1	17
MAY	-2.036	13	22	2.557	14	16
JUNE	-2.122	15	12	2.385	13	16
JULY	-2.409	14	12	2.580	12	16
AUGUST	-2.558	11	11	2.806	12	5
SEPTEMBER	-2.492	9	11	3.077	10	5
OCTOBER	-2.157	8	10	2.974	8	3
NOVEMBER	-2.156	5	9	2.776	20	14
DECEMBER	-1.967	22	23	2.894	22	16
ANNUAL	-2.859	1	23	3.077	10	5

IMMINGHAM

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.351	4	3	7.625	31	19
FEBRUARY	0.527	1	2	7.542	1	20
MARCH	-0.136	2	2	7.847	28	17
APRIL	0.660	15	1	7.389	15	19
MAY	0.830	14	0	7.384	14	18
JUNE	0.878	14	14	7.193	13	19
JULY	0.568	13	14	7.405	14	8
AUGUST	0.394	11	14	7.652	11	7
SEPTEMBER	0.402	9	13	8.068	10	7
OCTOBER	0.379	8	13	7.783	8	6
NOVEMBER	0.831	5	12	7.659	20	17
DECEMBER	0.989	24	2	7.667	22	19
ANNUAL	-0.136	2	2	8.068	10	7

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-3.549	4	3	3.725	31	19
FEBRUARY	-3.373	1	2	3.642	1	20
MARCH	-4.036	2	2	3.947	28	17
APRIL	-3.240	15	1	3.489	15	19
MAY	-3.070	14	0	3.484	14	18
JUNE	-3.022	14	14	3.293	13	19
JULY	-3.332	13	14	3.505	14	8
AUGUST	-3.506	11	14	3.752	11	7
SEPTEMBER	-3.498	9	13	4.168	10	7
OCTOBER	-3.521	8	13	3.883	8	6
NOVEMBER	-3.069	5	12	3.759	20	17
DECEMBER	-2.911	24	2	3.767	22	19
ANNUAL	-4.036	2	2	4.168	10	7

LOWESTOFT

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-0.087	4	7	2.916	6	1
FEBRUARY	-0.006	27	3	2.758	4	1
MARCH	-0.587	2	5	3.413	28	20
APRIL	0.189	15	4	2.569	15	22
MAY	0.327	14	4	2.734	12	20
JUNE	0.296	16	19	2.581	18	14
JULY	0.098	14	18	2.715	12	10
AUGUST	0.070	11	17	2.961	27	11
SEPTEMBER	0.084	9	17	3.008	10	11
OCTOBER	0.110	7	16	2.890	7	9
NOVEMBER	0.301	5	15	3.391	20	21
DECEMBER	0.340	23	5	3.027	22	22
ANNUAL	-0.587	2	5	3.413	28	20

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-1.587	4	7	1.416	6	1
FEBRUARY	-1.506	27	3	1.258	4	1
MARCH	-2.087	2	5	1.913	28	20
APRIL	-1.311	15	4	1.069	15	22
MAY	-1.173	14	4	1.234	12	20
JUNE	-1.204	16	19	1.081	18	14
JULY	-1.402	14	18	1.215	12	10
AUGUST	-1.430	11	17	1.461	27	11
SEPTEMBER	-1.416	9	17	1.508	10	11
OCTOBER	-1.390	7	16	1.390	7	9
NOVEMBER	-1.199	5	15	1.891	20	21
DECEMBER	-1.160	23	5	1.527	22	22
ANNUAL	-2.087	2	5	1.913	28	20

SHEERNESS

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	0.162	4	10	6.170	2	14
FEBRUARY	0.249	27	6	5.953	28	13
MARCH	-0.588	2	9	6.178	3	2
APRIL	0.261	15	7	5.878	1	2
MAY	0.315	14	7	5.942	15	1
JUNE	0.524	14	21	5.832	14	2
JULY	0.310	13	21	5.954	13	2
AUGUST	0.199	12	21	5.994	10	1
SEPTEMBER	0.096	9	20	6.140	10	14
OCTOBER	0.126	7	19	6.147	7	0
NOVEMBER	0.515	21	18	6.327	21	0
DECEMBER	0.535	24	9	6.143	22	13
ANNUAL	-0.588	2	9	6.327	21	0

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	MINIMA DAY	MINIMA HR.	MAXIMA HEIGHT	MAXIMA DAY	MAXIMA HR.
JANUARY	-2.738	4	10	3.270	2	14
FEBRUARY	-2.651	27	6	3.053	28	13
MARCH	-3.488	2	9	3.278	3	2
APRIL	-2.639	15	7	2.978	1	2
MAY	-2.585	14	7	3.042	15	1
JUNE	-2.376	14	21	2.932	14	2
JULY	-2.590	13	21	3.054	13	2
AUGUST	-2.701	12	21	3.094	10	1
SEPTEMBER	-2.804	9	20	3.240	10	14
OCTOBER	-2.774	7	19	3.247	7	0
NOVEMBER	-2.385	21	18	3.427	21	0
DECEMBER	-2.365	24	9	3.243	22	13
ANNUAL	-3.488	2	9	3.427	21	0

DOVER

DATUM = DATUM OF DATA

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	0.569	30	7	7.009	3	1
FEBRUARY	0.496	2	9	6.938	1	1
MARCH	0.019	2	8	7.436	3	1
APRIL	0.455	15	7	6.838	16	0
MAY	0.770	14	6	6.819	12	22
JUNE	0.778	13	7	6.643	14	0
JULY	0.563	13	20	6.793	12	12
AUGUST	0.423	11	20	6.988	12	13
SEPTEMBER	0.397	9	20	7.157	10	13
OCTOBER	0.573	9	20	7.085	7	11
NOVEMBER	0.648	5	18	7.271	20	22
DECEMBER	0.785	23	8	7.095	23	0
ANNUAL	0.019	2	8	7.436	3	1

DATUM = ORDNANCE DATUM (NEWLYN)

MONTH	MINIMA HEIGHT	DAY	HR.	MAXIMA HEIGHT	DAY	HR.
JANUARY	-3.101	30	7	3.339	3	1
FEBRUARY	-3.174	2	9	3.268	1	1
MARCH	-3.651	2	8	3.766	3	1
APRIL	-3.215	15	7	3.168	16	0
MAY	-2.900	14	6	3.149	12	22
JUNE	-2.892	13	7	2.973	14	0
JULY	-3.107	13	20	3.123	12	12
AUGUST	-3.247	11	20	3.318	12	13
SEPTEMBER	-3.273	9	20	3.487	10	13
OCTOBER	-3.097	9	20	3.415	7	11
NOVEMBER	-3.022	5	18	3.601	20	22
DECEMBER	-2.885	23	8	3.425	23	0
ANNUAL	-3.651	2	8	3.766	3	1

3. ANALYSED DATA STATISTICS

3.2 Mean sea level values

MONTHLY MEAN SEA LEVEL VALUES TO CHART DATUM

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
NEWLYN	3.107	3.161	3.121	3.177	3.080	3.145	3.154	3.170	3.238	3.356	3.222	3.318	3.187
ILFRACOMBE	4.884	4.952	4.920	4.950	4.851	4.942	4.930	4.947	5.027	5.147	5.000	5.076	4.969
AVONMOUTH	6.781	6.863	6.865	6.845	6.764	6.870	6.844	6.907	7.007	7.095	6.937	7.064	6.904
HOLYHEAD	3.141	3.220	3.183	3.202	3.092	3.201	3.193	3.216	3.324	3.422	3.269	3.381	3.237
MILLPORT	1.914	1.976	1.946	1.931	1.820	1.924	1.924	1.946	2.108	2.178	2.015	2.143	1.985
STORNOWAY	2.739	2.825	2.784	2.744	2.689	2.747	2.778	2.824	2.999	3.035	2.912	3.015	2.841
WICK	1.900	1.991	1.945	1.924	1.865	1.914	1.965	1.991	2.151	2.158	2.070	2.155	2.002
ABERDEEN	2.412	2.502	2.423	2.444	2.407	2.445	2.496	2.528	2.644	2.642	2.587	2.649	2.515
NORTH SHIELDS	2.845	2.896	2.811	2.861	2.813	2.857	2.910	2.945	3.018	3.015	2.995	3.029	2.916
IMMINGHAM	4.106	4.142	4.049	4.129	4.149	4.160	4.202	4.254	4.303	4.262	4.266	4.269	4.191
LOWESTOFT	1.524	1.568	1.471	1.514	1.584	1.565	1.627	1.674	1.710	1.629	1.717	1.679	1.605
SHEERNESS	2.976	2.989	2.880	2.926	3.001	2.959	3.037	3.066	3.086	3.030	3.178	3.095	3.018
DOVER	3.590	3.672	3.612	3.646	3.688	3.689	3.738	3.771	3.797	3.792	3.816	3.773	3.715

MONTHLY MEAN SEA LEVEL VALUES TO ORDNANCE DATUM NEWLYN

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
NEWLYN	0.057	0.111	0.071	0.127	0.030	0.095	0.104	0.120	0.188	0.306	0.172	0.268	0.137
ILFRACOMBE	0.084	0.152	0.120	0.150	0.051	0.142	0.130	0.147	0.227	0.347	0.200	0.276	0.169
AVONMOUTH	0.281	0.363	0.365	0.345	0.264	0.370	0.344	0.407	0.507	0.595	0.437	0.564	0.404
HOLYHEAD	0.091	0.170	0.133	0.152	0.042	0.151	0.143	0.166	0.274	0.372	0.219	0.331	0.187
MILLPORT	0.294	0.356	0.326	0.311	0.200	0.304	0.304	0.326	0.488	0.558	0.395	0.523	0.365
STORNOWAY*	0.029	0.115	0.074	0.034	-0.021	0.037	0.068	0.114	0.289	0.325	0.202	0.305	0.131
WICK	0.190	0.281	0.235	0.214	0.155	0.204	0.255	0.281	0.441	0.448	0.360	0.445	0.292
ABERDEEN	0.162	0.252	0.173	0.194	0.157	0.195	0.246	0.278	0.394	0.392	0.337	0.399	0.265
NORTH SHIELDS	0.245	0.296	0.211	0.261	0.213	0.257	0.310	0.345	0.418	0.415	0.395	0.429	0.316
IMMINGHAM	0.206	0.242	0.149	0.229	0.249	0.260	0.302	0.354	0.403	0.362	0.366	0.369	0.291
LOWESTOFT	0.024	0.068	-0.029	0.014	0.084	0.065	0.127	0.174	0.210	0.129	0.217	0.179	0.105
SHEERNESS	0.076	0.089	-0.020	0.026	0.101	0.059	0.137	0.166	0.186	0.130	0.278	0.195	0.118
DOVER	-0.080	0.002	-0.058	-0.024	0.018	0.019	0.068	0.101	0.127	0.122	0.146	0.103	0.045

* ORDNANCE DATUM LOCAL

3. ANALYSED DATA STATISTICS

3.2.1 Mean sea level anomalies

MEAN SEA LEVEL ANOMALIES

(MONTHLY MEAN - ANNUAL MEAN)

(MMS)

WEST COAST (N - S)

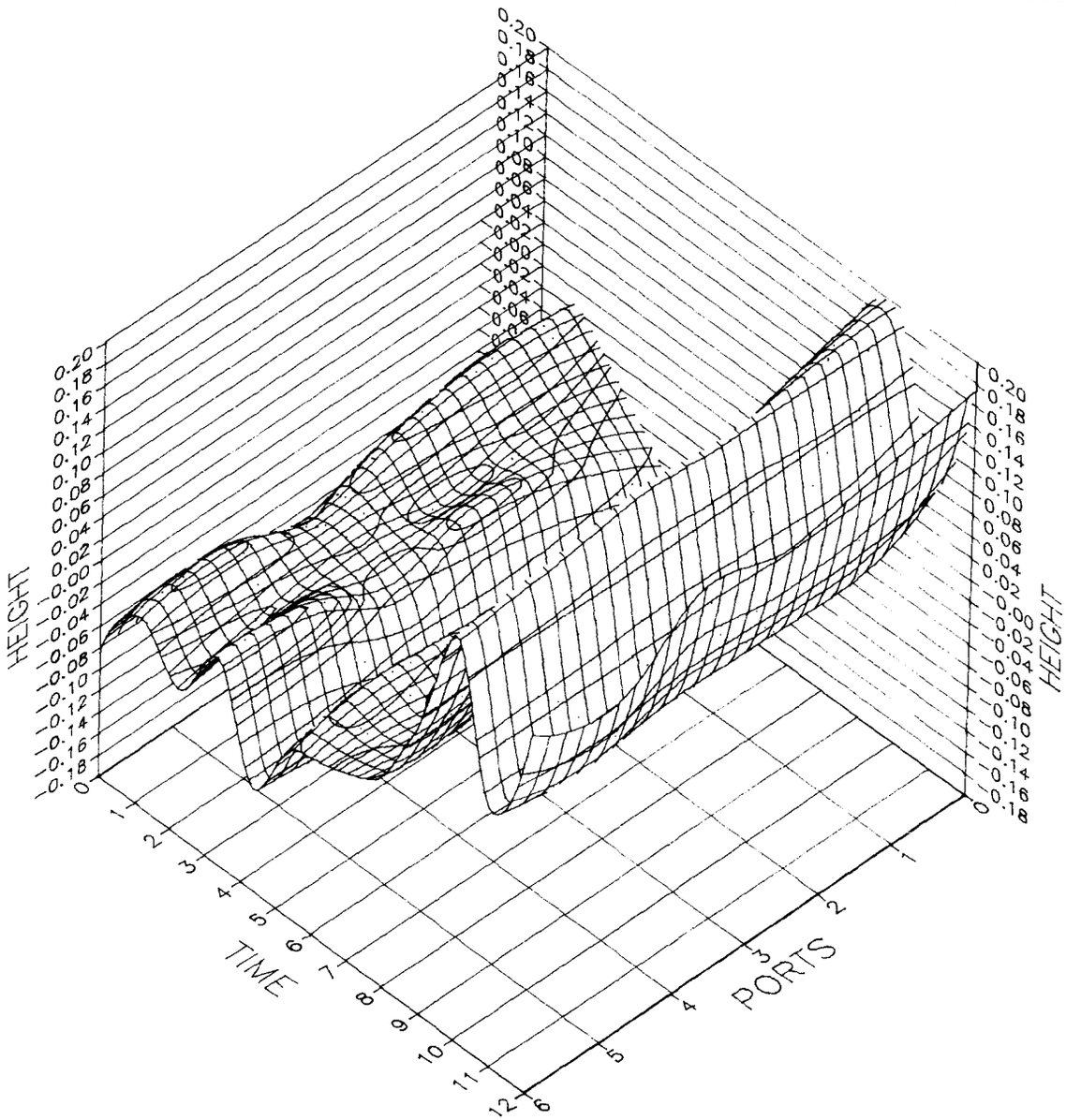
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1.1.	STORNOWAY	-102	-16	-57	-97	-152	-94	-63	-17	158	194	71	174
1.2.	MILLPORT	-71	-9	-39	-54	-165	-61	-61	-39	123	193	30	158
1.3.	HOLYHEAD	-96	-17	-54	-35	-145	-36	-44	-21	87	185	32	144
1.4.	AVONMOUTH	-123	-41	-39	-59	-140	-34	-60	3	103	191	33	160
1.5.	ILFRACOMBE	-85	-17	-49	-19	-118	-27	-39	-22	58	178	31	107
1.6.	NEWLYN	-80	-26	-66	-10	-107	-42	-33	-17	51	169	35	131

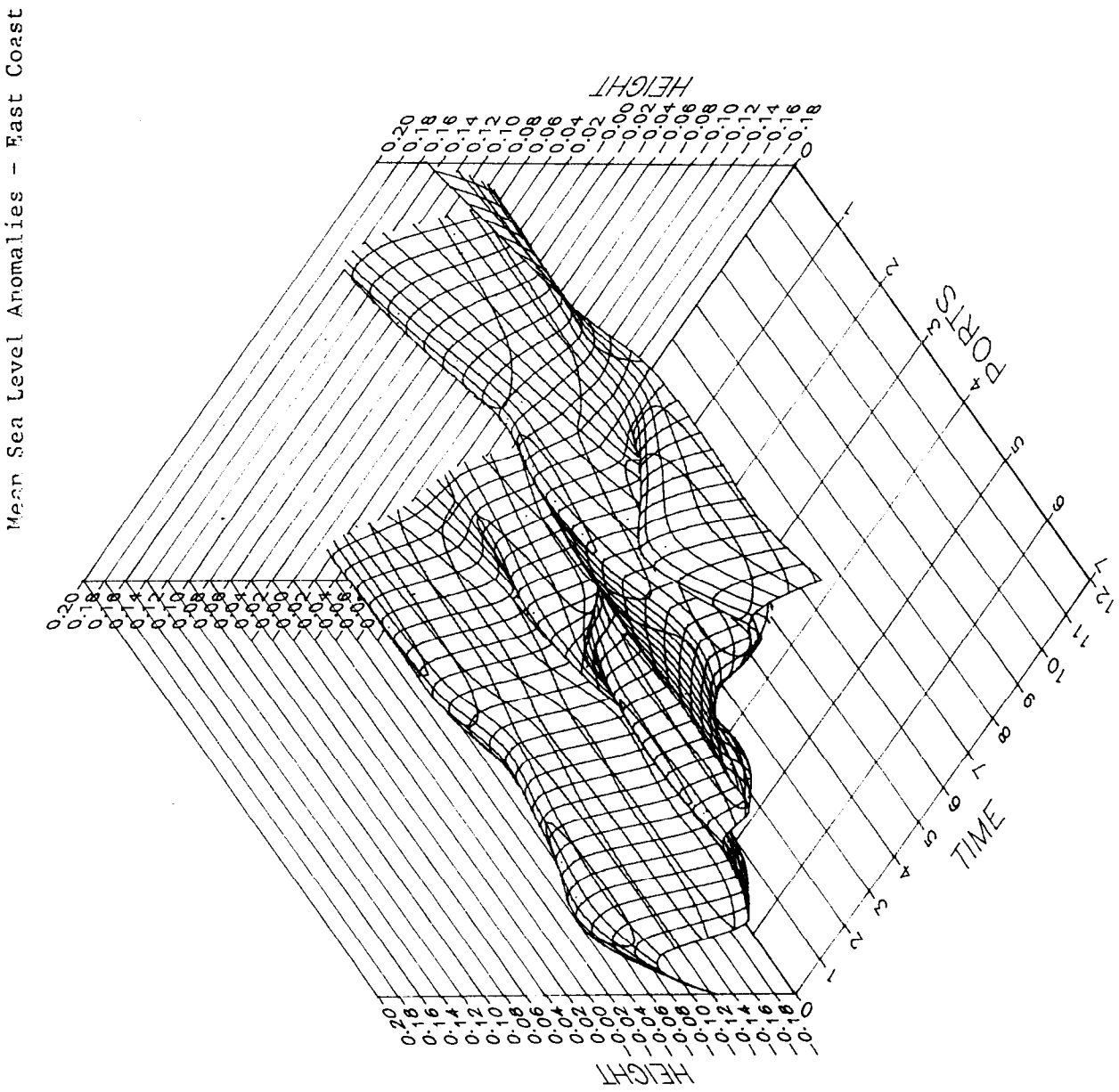
EAST COAST (N - S)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2.1.	WICK	-102	-11	-57	-78	-137	-88	-37	-11	149	156	68	153
2.2.	ABERDEEN	-103	-13	-92	-71	-108	-70	-19	13	129	127	72	134
2.3.	NORTH SHIELDS	-71	-20	-105	-55	-103	-59	-6	29	102	99	79	113
2.4.	IMMMINGHAM	-85	-49	-142	-62	-42	-31	11	63	112	71	75	78
2.5.	LOWESTOFT	-81	-37	-134	-91	-21	-40	22	69	105	24	112	74
2.6.	SHEERNESS	-42	-29	-138	-92	-17	-59	19	48	68	12	160	77
2.7.	DOVER	-125	-43	-103	-69	-27	-26	23	56	82	77	101	58

VALUES ARE DEPICTED IN GRAPHICAL FORM ON THE FOLLOWING PAGES
(PORT NUMBERS RELATE TO THOSE ON THE DIAGRAMS)

Mean Sea Level Anomalies - West Coast




Mean Sea Level Anomalies - East Coast
HEIGHT
PORTS
TIME
HEIGHT

3. ANALYSED DATA STATISTICS

3.3 Statistics of residuals

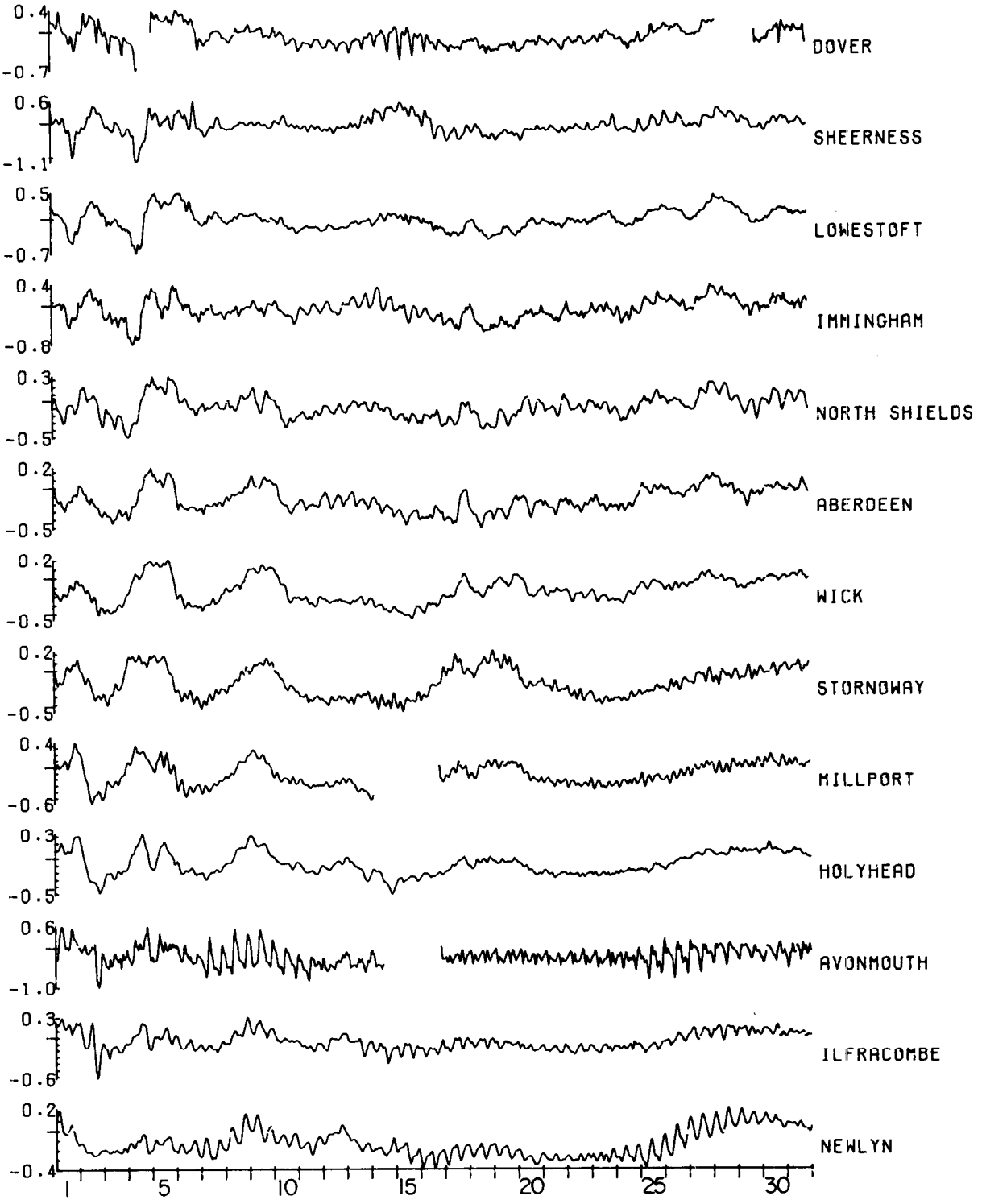
RESIDUAL STATISTICS 1987

PORT	STAT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
NEWLYN	MEAN	-.140	-.047	-.030	.049	-.062	-.020	-.022	-.001	.073	.177	.007	.069	.005
	MAX	.215	.252	.625	.493	.233	.238	.389	.230	.329	.712	.399	.458	.712
	MIN	-.399	-.336	-.285	-.197	-.355	-.207	-.240	-.204	-.189	-.154	-.252	-.233	-.399
	S.D.	.137	.121	.132	.125	.093	.084	.118	.083	.095	.151	.112	.133	
ILFRACOMBE	MEAN	-.075	.062	.091	.130	.006	.078	.059	.059	.104	.174	-.009	.068	.062
	MAX	.300	.438	1.588	.488	.293	.534	.449	.387	.472	.813	.709	.533	1.588
	MIN	-.629	-.293	-.272	-.115	-.357	-.175	-.146	-.177	-.166	-.149	-.560	-.457	-.629
	S.D.	.137	.132	.183	.113	.105	.104	.113	.091	.122	.173	.164	.177	
AVONMOUTH	MEAN	-.263	-.122	-.018	.073	-.014	.007	-.097	-.076	.067	.195	.004	.019	-.018
	MAX	.913	.933	2.738	1.256	.916	.786	.606	.741	.838	2.903	.912	.634	2.903
	MIN	-1.110	-1.015	-1.117	-.756	-.794	-.574	-.706	-.779	-.683	-.795	-.766	-.533	-1.117
	S.D.	.350	.333	.392	.357	.294	.257	.217	.244	.261	.365	.302	.246	
HOLYHEAD	MEAN	-.096	.020	.023	.048	-.075	.040	.015	.007	.078	.144	-.019	.110	.026
	MAX	.330	.453	1.032	.317	.217	.179	.282	.218	.489	.587	.567	.805	1.032
	MIN	-.522	-.295	-.321	-.235	-.416	-.100	-.135	-.206	-.166	-.143	-.579	-.346	-.579
	S.D.	.158	.152	.184	.098	.122	.050	.092	.078	.123	.158	.194	.185	
MILLPORT	MEAN	-.133	.009	.062	.081	-.050	.017	-.007	.007	.160	.194	-.022	.075	.034
	MAX	.381	.822	1.186	.503	.399	.470	.311	.340	.695	.884	.821	.901	1.186
	MIN	-.590	-.339	-.466	-.151	-.475	-.162	-.196	-.289	-.165	-.167	-.739	-.505	-.739
	S.D.	.185	.181	.218	.108	.140	.095	.104	.103	.159	.182	.268	.224	
STORNOWAY	MEAN	-.154	-.032	-.040	-.048	-.111	-.040	-.016	-.012	.111	.107	-.033	.080	-.015
	MAX	.232	.381	.434	.317	.172	.268	.259	.349	.473	.578	.643	.565	.643
	MIN	-.491	-.370	-.384	-.318	-.521	-.343	-.303	-.233	-.241	-.190	-.561	-.438	-.561
	S.D.	.171	.176	.145	.110	.115	.097	.116	.113	.164	.143	.217	.214	
WICK	MEAN	-.146	.001	-.016	-.028	-.065	.023	.082	.049	.109	.032	-.078	.046	.001
	MAX	.211	.452	.352	.234	.225	.253	.306	.296	.506	.513	.518	.539	.539
	MIN	-.465	-.286	-.309	-.273	-.476	-.178	-.100	-.192	-.227	-.284	-.512	-.452	-.512
	S.D.	.141	.170	.130	.098	.125	.080	.077	.098	.160	.153	.217	.213	
ABERDEEN	MEAN	-.161	-.012	-.038	.010	-.031	-.011	.016	.017	.094	.053	-.023	.049	-.003
	MAX	.249	.444	.444	.274	.286	.158	.378	.290	.454	.547	.560	.606	.606
	MIN	-.520	-.321	-.394	-.206	-.317	-.199	-.259	-.306	-.271	-.272	-.403	-.390	-.520
	S.D.	.151	.171	.161	.093	.114	.072	.086	.109	.150	.161	.196	.178	
N.SHIELDS	MEAN	-.093	.013	-.029	.024	-.035	-.008	.028	.024	.053	.023	.001	.049	.004
	MAX	.342	.588	.904	.416	.278	.294	.288	.421	.463	.574	.594	.692	.904
	MIN	-.505	-.373	-.610	-.268	-.295	-.343	-.276	-.322	-.293	-.389	-.301	-.363	-.610
	S.D.	.153	.158	.221	.109	.116	.108	.098	.125	.145	.173	.187	.180	
IMMINGHAM	MEAN	-.093	-.012	-.074	.012	.023	.023	.051	.080	.094	.021	.011	.030	.016
	MAX	.414	.665	1.055	.411	.499	.375	.391	.519	.571	.586	.862	.957	1.055
	MIN	-.789	-.413	-.687	-.290	-.304	-.275	-.200	-.358	-.237	-.825	-.416	-.566	-.825
	S.D.	.197	.158	.272	.106	.134	.096	.096	.132	.142	.193	.183	.179	
LOWESTOFT	MEAN	-.031	.061	-.015	.016	.060	.032	.097	.134	.137	.021	.092	.072	.056
	MAX	.535	.640	1.166	.511	.654	.352	.470	.633	.599	.506	1.191	.844	1.191
	MIN	-.746	-.406	-.784	-.212	-.292	-.194	-.108	-.196	-.194	-.775	-.368	-.392	-.784
	S.D.	.207	.161	.323	.108	.153	.102	.098	.138	.153	.185	.218	.183	
SHEERNESS	MEAN	-.081	-.044	-.147	-.104	-.036	-.086	-.021	-.017	-.029	-.093	.065	.008	-.053
	MAX	.625	.631	1.295	.356	.694	.396	.582	.618	.776	.527	1.408	.801	1.408
	MIN	-1.152	-.633	-1.330	-.450	-.471	-.738	-.447	-.380	-.540	-.813	-.433	-.593	-1.330
	S.D.	.251	.192	.334	.139	.178	.142	.132	.146	.181	.198	.264	.199	
DOVER	MEAN	-.106	.009	-.029	.002	.027	.019	.062	.080	.077	.036	.049	.026	.021
	MAX	.397	.663	1.000	.335	.505	.306	.381	.409	.506	.723	.811	.445	1.000
	MIN	-.723	-.348	-.703	-.251	-.270	-.374	-.226	-.337	-.303	-.759	-.440	-.607	-.759
	S.D.	.174	.143	.251	.097	.133	.097	.099	.117	.119	.178	.198	.168	

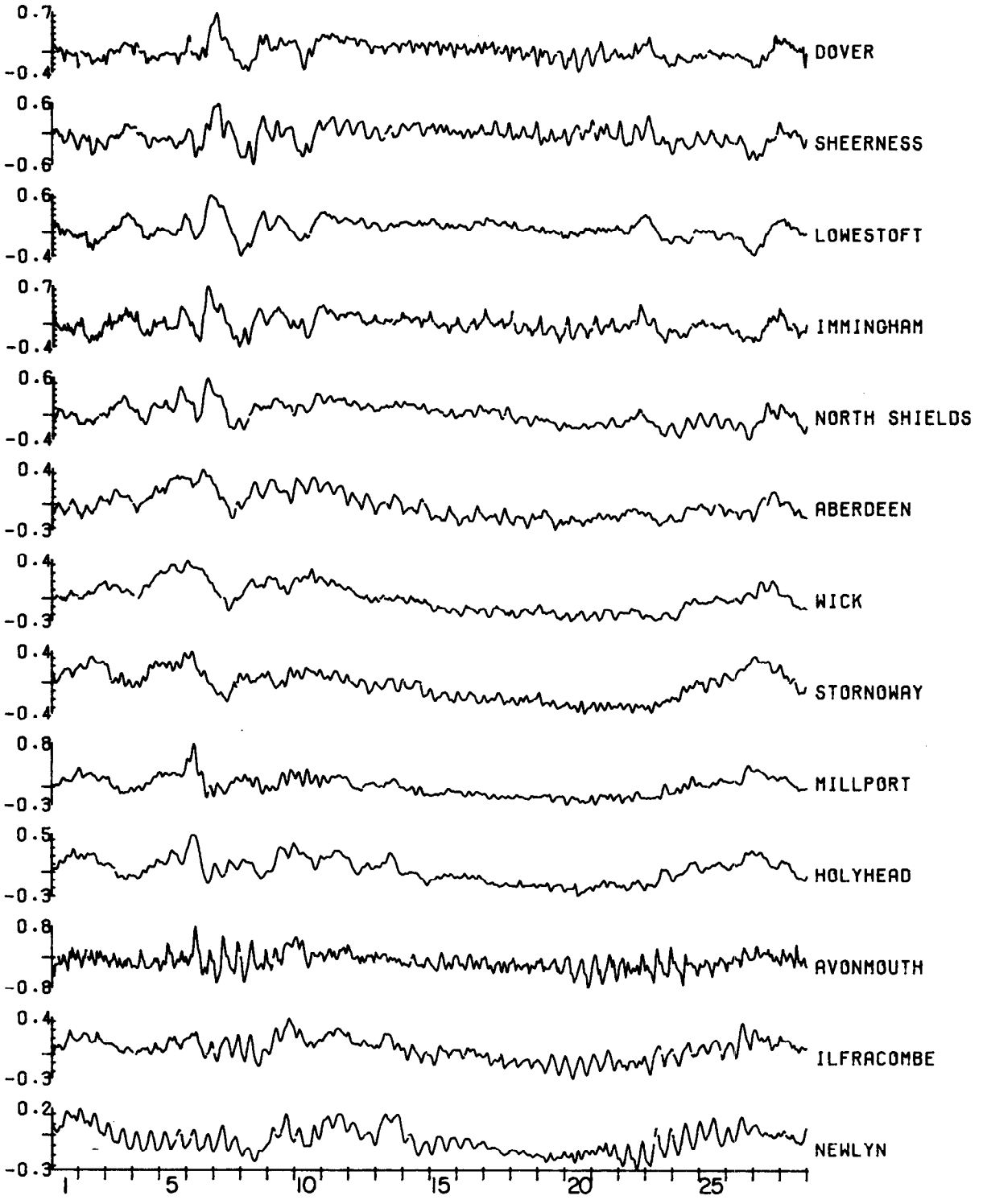
3. ANALYSED DATA STATISTICS

3.4 Time series plots of residuals

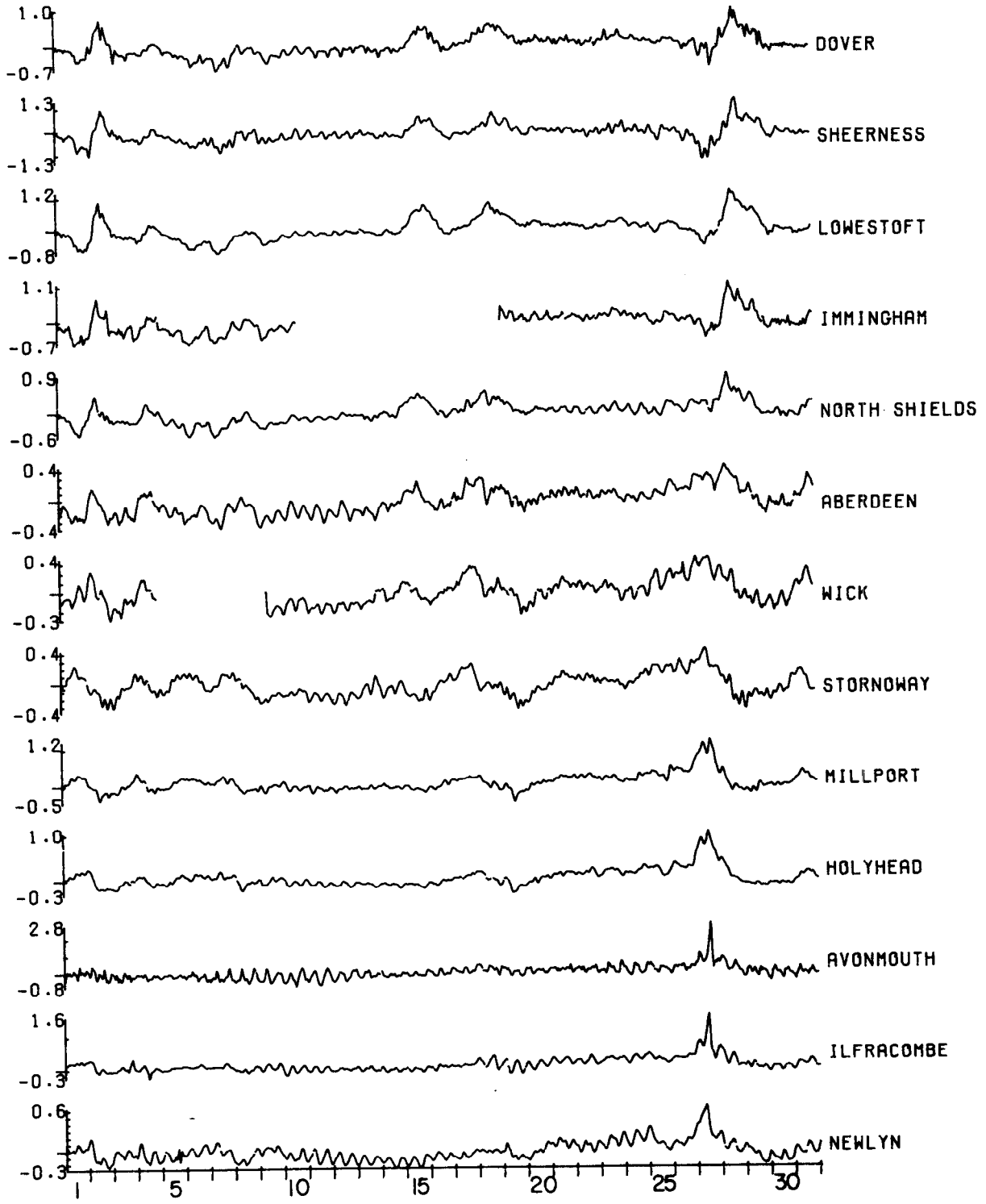
HOURLY RESIDUALS JANUARY 1987
(METRES)



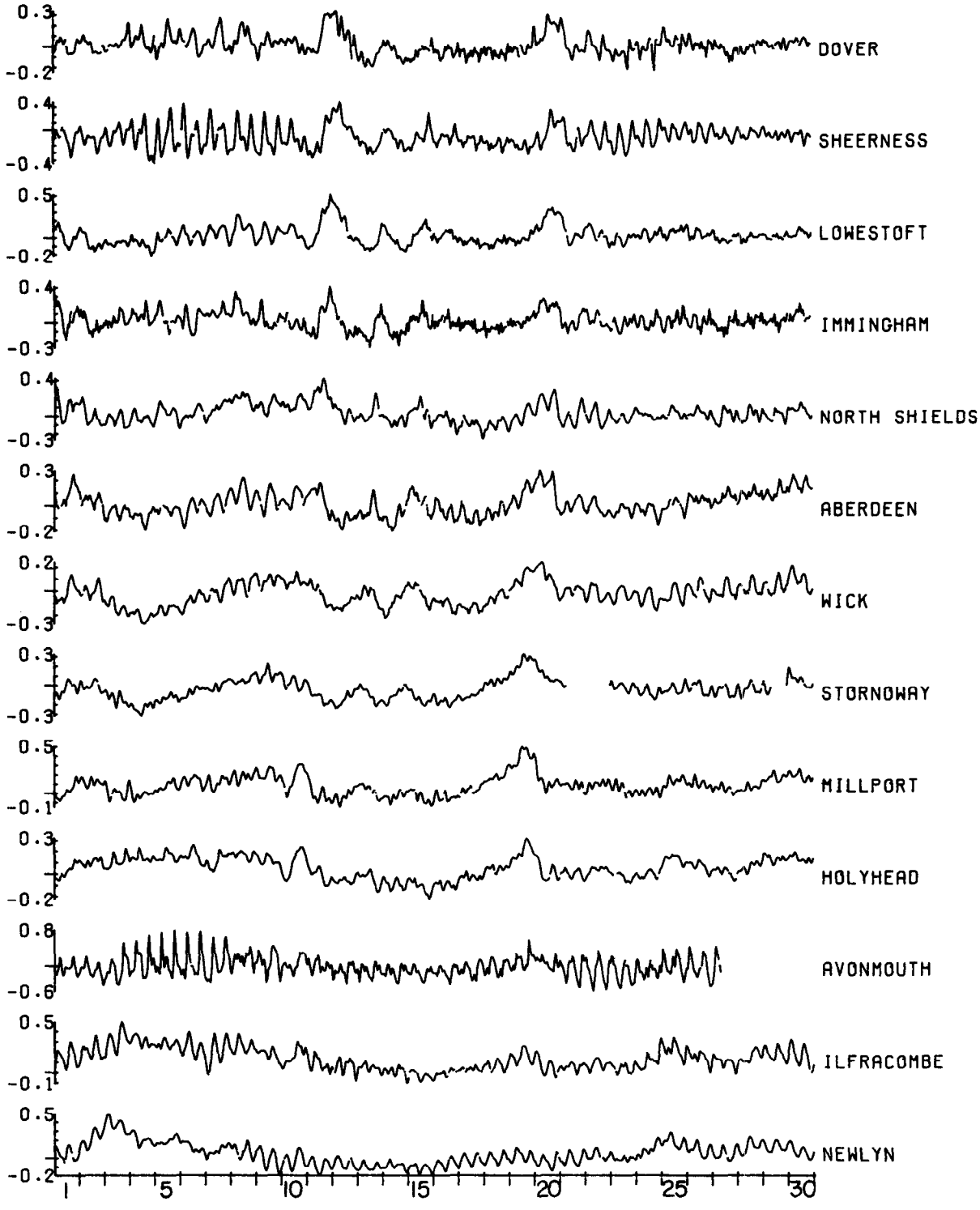
HOURLY RESIDUALS FEBRUARY 1987
(METRES)



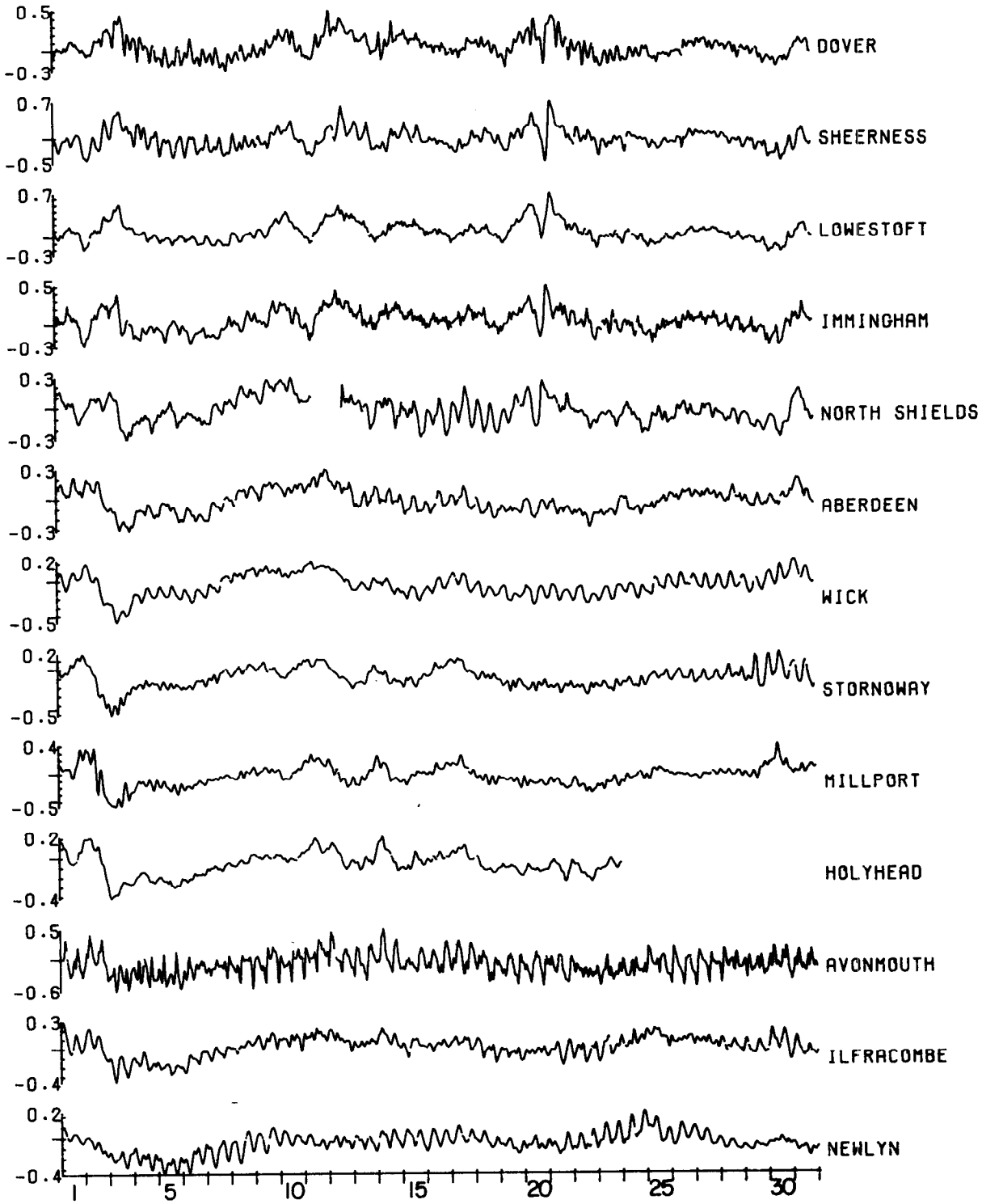
HOURLY RESIDUALS MARCH 1987
(METRES)



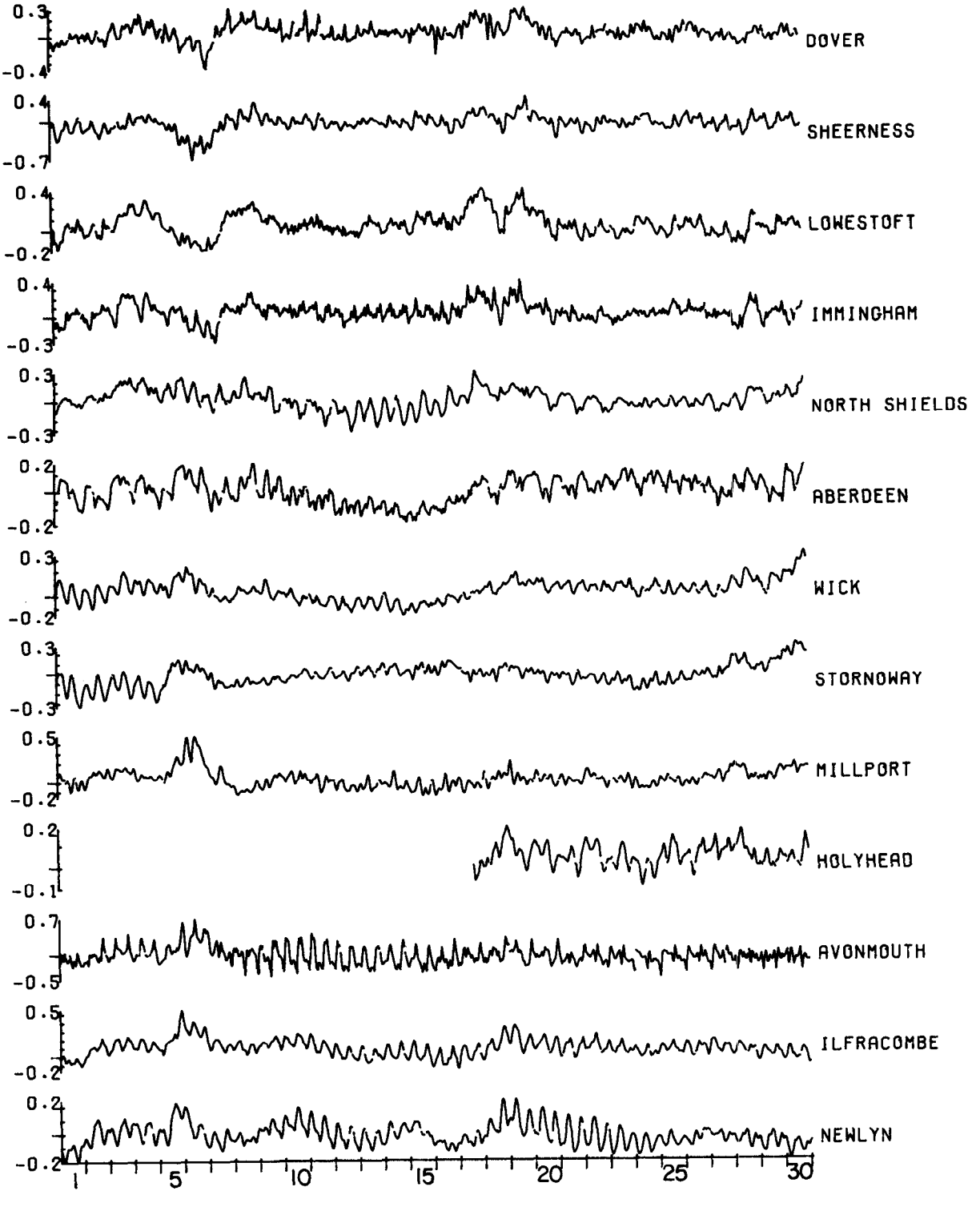
HOURLY RESIDUALS APRIL 1987
(METRES)



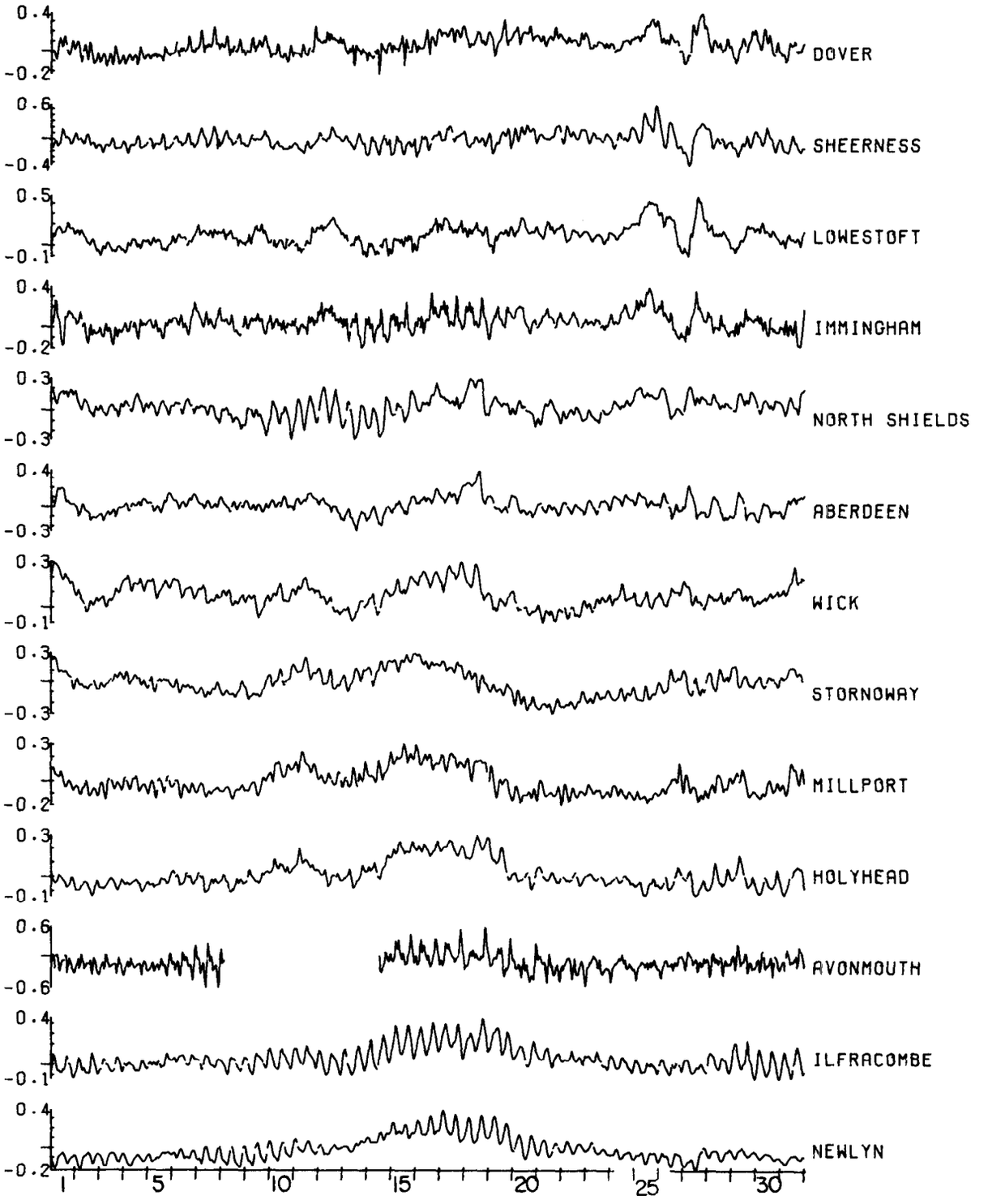
HOURLY RESIDUALS MAY 1987
(METRES)



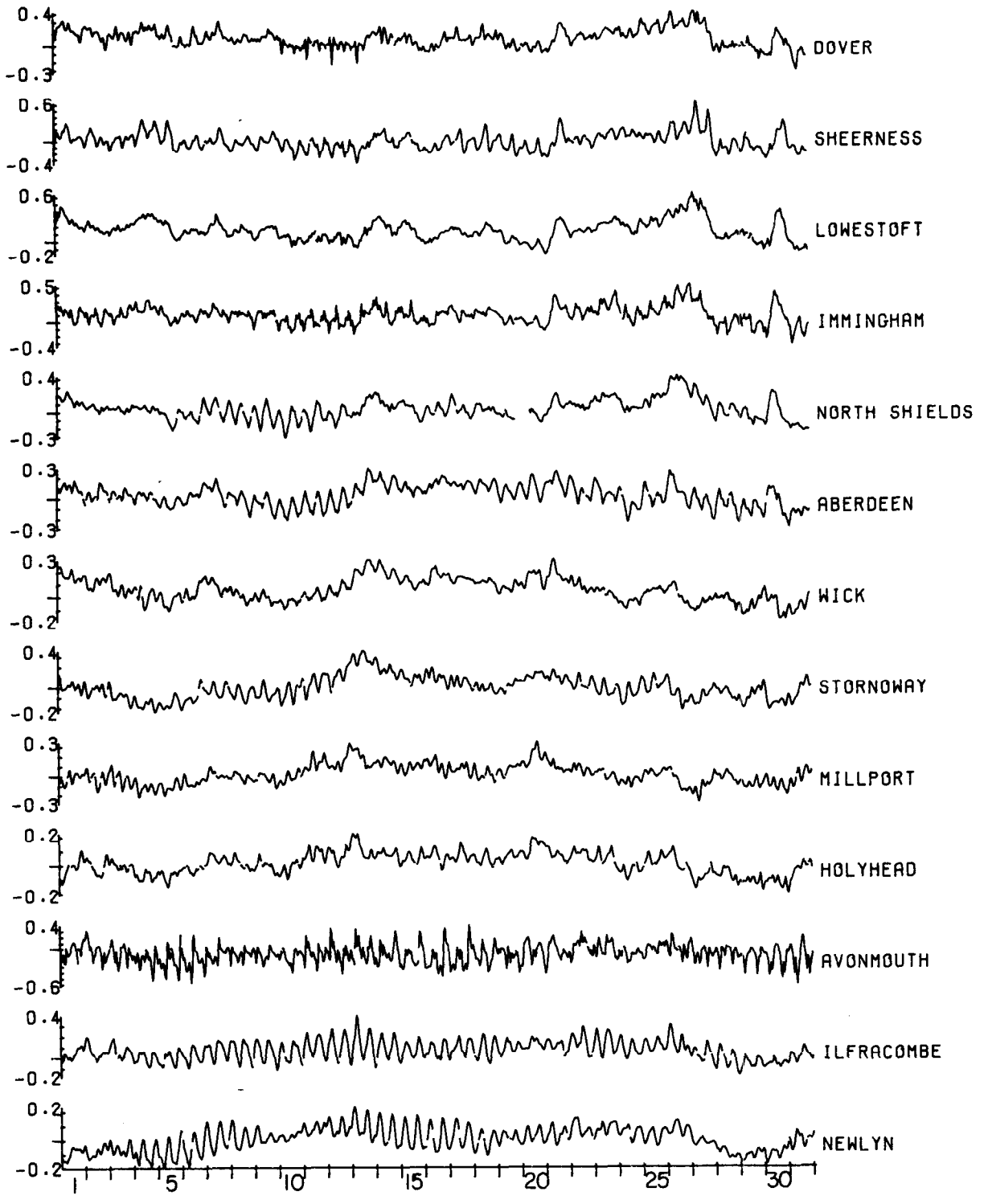
HOURLY RESIDUALS JUNE 1987
(METRES)



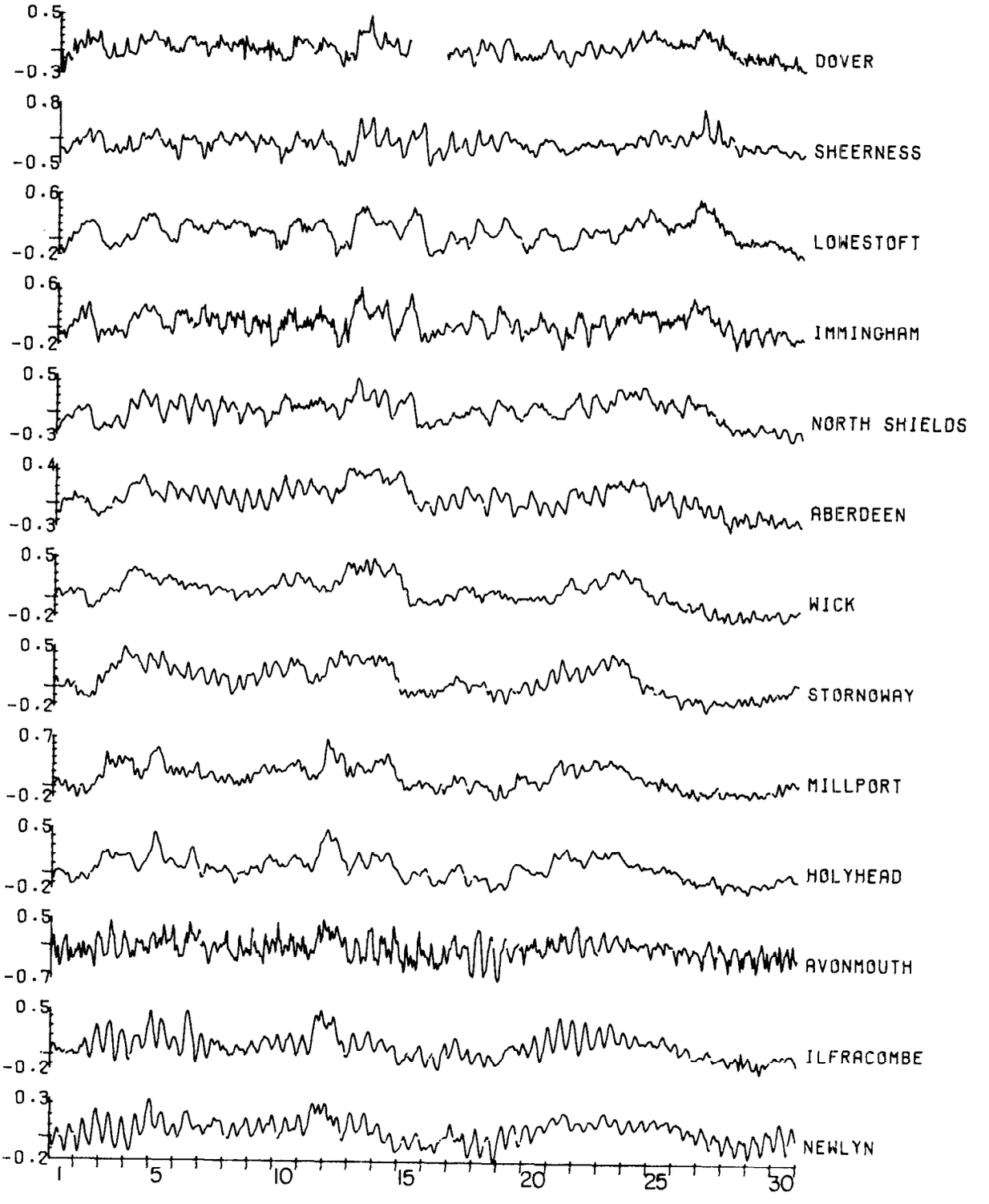
HOURLY RESIDUALS JULY 1987
(METRES)



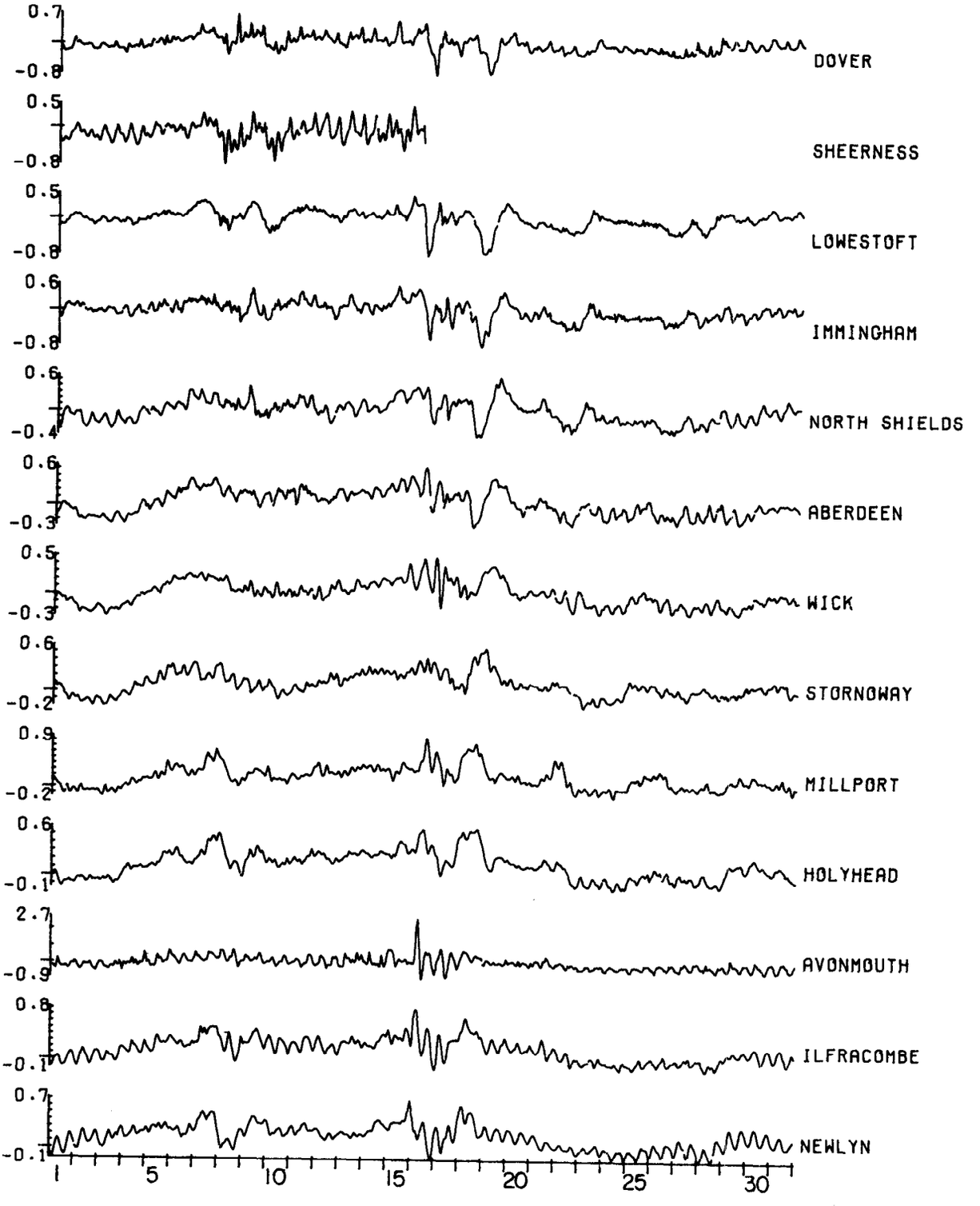
HOURLY RESIDUALS AUGUST 1987
(METRES)



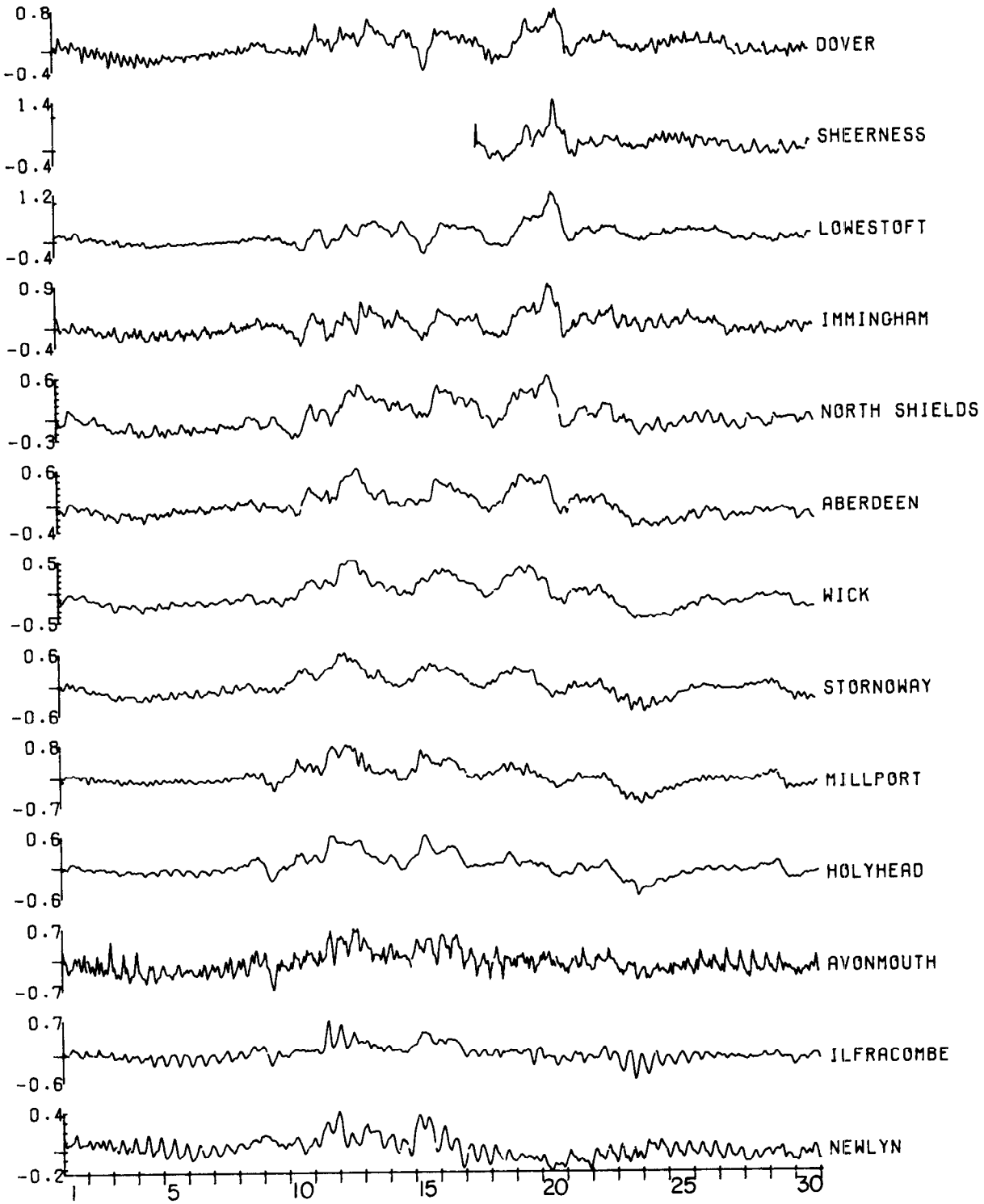
HOURLY RESIDUALS SEPTEMBER 1987
(METRES)



HOURLY RESIDUALS OCTOBER 1987
(METRES)



HOURLY RESIDUALS NOVEMBER 1987
(METRES)



HOURLY RESIDUALS DECEMBER 1987
(METRES)